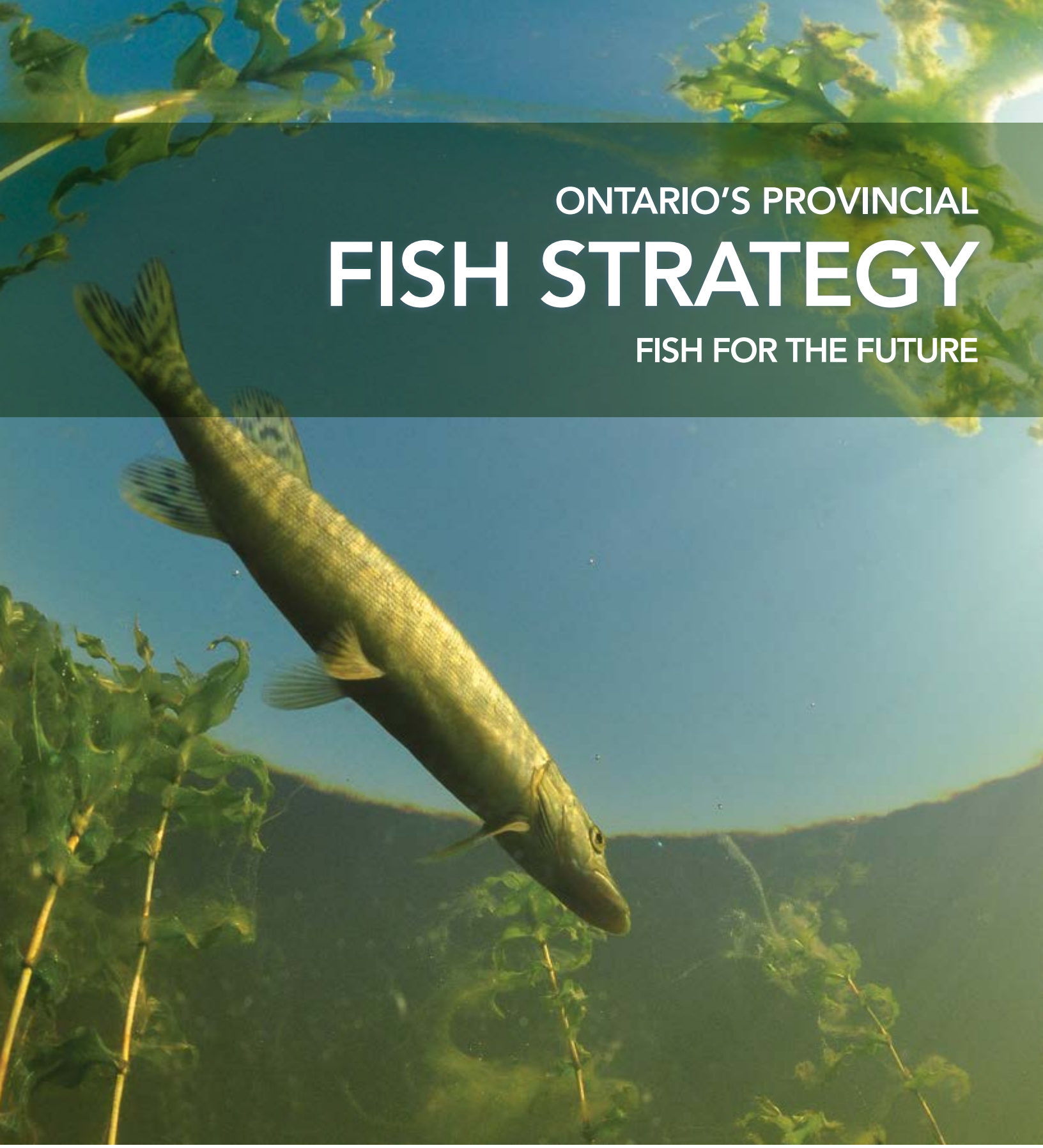

ONTARIO'S PROVINCIAL FISH STRATEGY

FISH FOR THE FUTURE

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Ontario

Summary

This is a guiding document for managing fisheries resources in Ontario. It identifies provincial fisheries goals, objectives and tactics to achieve them. The main purposes of the strategy are to improve the conservation and management of Ontario's fisheries resources; and to promote, facilitate and encourage fishing as an activity that contributes to the nutritional needs, and the social, cultural and economic well-being of individuals and communities in Ontario.

The Provincial Fish Strategy provides management direction to MNRF staff and will better position the ministry to respond to evolving environmental, economic, social, technological and policy challenges facing fisheries in Ontario.

Resumé

Il s'agit d'un document d'orientation pour la gestion des ressources halieutiques en Ontario. Ce document établit les buts et les objectifs provinciaux en matière de pêche ainsi que les tactiques permettant de les atteindre. La stratégie vise principalement à améliorer la conservation et la gestion des ressources halieutiques en Ontario ainsi qu'à promouvoir, faciliter et encourager la pêche comme activité qui contribue aux besoins nutritionnels et au bien-être social, culturel et économique des résidents et des collectivités en Ontario.

La politique stratégique provinciale relative à la pêche fournit une orientation de gestion au personnel du MRNF et met le ministère en meilleure position pour réagir aux facteurs l'évolution des défis environnementaux, économiques, sociaux, technologiques et politiques des ressources halieutiques en Ontario.

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On the cover: Northern Pike (*Esox lucius*). P. Vecsei

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Lake Trout (*Salvelinus namaycush*). J. Borwick

M. Garvin

1. Purpose of the Provincial Fish Strategy

Ontario's **fisheries resources** are an important part of its **biodiversity**[1], and contribute to the province's economic, social, and environmental well-being. This document, *Ontario's Provincial Fish Strategy: Fish for the Future*, sets out a practical and strategic framework for managing Ontario's fisheries resources from 2015 forward. It identifies key overarching management approaches: **landscape management**, a risk-informed approach, and **adaptive management** (Section 6); specific goals, objectives and tactics (Section 7); and a proposed implementation approach (Section 8), to guide the Ministry of Natural Resources and Forestry's (MNRF) **stewardship** of fisheries, fish communities and their supporting **ecosystems**.[2] The *Strategy* is intended to be flexible, allowing MNRF and its partners to address new management challenges and priorities as they emerge.

This *Strategy* has two primary purposes:

- To improve the **conservation** and management of fisheries and the ecosystems on which fish communities depend; and
- To promote, facilitate and encourage fishing as an activity that contributes to the nutritional needs and the social, cultural and economic well-being of individuals and communities in Ontario.

This document will help to inform MNRF fisheries policy development, decision making and **science** priorities and will provide input into other natural resources management policy and planning. It will also assist MNRF in prioritizing its efforts and coordinating its activities as it addresses new and emerging **issues** that impact Ontario's fisheries resources. In cases where decision makers must balance competing objectives for the management of aquatic systems, this document can help to provide a fisheries perspective in the discussion.

MNRF cannot manage Ontario's fisheries resources in isolation. **Collaboration** and coordination – with all levels of government, First Nations and Métis communities, provincial partner agencies and **stakeholders** – are themes that run through this *Strategy*. *Fish for the Future* is intended to serve as a resource to guide other agencies and levels of government in their own program and policy decisions. It will also increase accountability and transparency by communicating MNRF's priorities to First Nations and Métis communities, Non-Governmental Organizations (NGOs), stakeholders and the general public.

1. Terms shown in bold font are defined in the Glossary at the end of this document.
2. Ontario's fisheries resources include fish species, fish communities, commercial, recreational and First Nations and Métis fisheries, and the aquatic ecosystems that support them. In the interests of brevity, this *Strategy* will refer to "Ontario's fisheries resources" to reflect the broader suite of resources and activities.

Rainbow Trout (*Oncorhynchus mykiss*). K. Colllins

History of Fisheries Strategic Planning in Ontario

Strategic planning for Ontario's fisheries by the Ministry of Natural Resources and Forestry began more than 40 years ago, in response to the **fishery** declines that occurred during the rapid economic growth of the post-World War II era. The then Ministry of Natural Resources (MNR) launched its first Strategic Plan for Ontario Fisheries (SPOF) in 1976. SPOF incorporated a number of innovative elements, including public involvement, resident sport fishing licences, commercial catch **quotas**, and the establishment of Fisheries Assessment Units throughout the province. Under SPOF, the province's fish hatcheries were also improved, and partnerships with other agencies were strengthened. Through District Fisheries Management Plans, developed with public input, SPOF identified long-term fisheries goals and the short-term actions necessary to achieve them. These activities slowed and reversed losses in some indigenous **fish stocks** in Ontario, allowing recovery to begin. SPOF was, however, narrowly focussed on individual water bodies, and did not provide the guidance necessary to manage fisheries resources at broader scales.

In 1992, MNR released the Strategic Plan for Ontario Fisheries II (SPOF II), with the goal of shifting site-specific management planning to a more comprehensive, aquatic ecosystem-based approach. While SPOF had achieved some gains, there was still widespread public concern about environmental health and a growing emphasis on **sustainable** management of fisheries resources. SPOF II included the notion of **sustainable development**, ensuring the continuation of fisheries benefits to current and future generations. It also affirmed the principle that there were limits to the productive capacity of fisheries; strengthened enforcement; and emphasized the need for science-based management strategies. SPOF II was a powerful biological and policy framework, but it was not supported by formal guidance on implementation. As a result, management continued to focus on individual water bodies, but often with little analysis to determine if management objectives were actually being met.

In 2005, the province recognized the need for a stronger emphasis on landscape level management of fisheries. A new Ecological Framework for Recreational Fisheries Management (EFFM) in Ontario replaced the 37 existing fishing "divisions" with 20 Fisheries Management Zones (FMZs) based on biological, climatic and social considerations. Regulatory tool kits were developed for key sport fish **species**, establishing broad-scale standards for setting fishing regulations. Key components included standardized broad-scale monitoring

A. Cytowicz

approaches, adaptive management, enhanced public engagement, and systematic state-of-the-resources reporting. This Ecological Framework did not set provincial fisheries management goals and objectives, however, and focussed only on the management of recreational fisheries. Shortly thereafter, MNR developed and released the Strategic Policy for Ontario's Commercial Fisheries, 2011, which provides a framework and focus for developing operational commercial fishing policies. However, this commercial fisheries strategy was linked neither to EFFM nor to a provincial framework for fisheries management.

Ontario's Provincial Fish Strategy: Fish for the Future incorporates and replaces SPOF II and fills the need for a new overarching strategic plan that guides the immediate and long-term management of recreational, commercial and Aboriginal fisheries resources in Ontario. It is based on the most recent science-based understanding of successful natural resources management approaches. It provides current context and identifies key social, economic and environmental trends with the potential to affect Ontario's fisheries resources, and uses that information to guide identification of operational tactics, and ultimately the successful achievement of fisheries management goals and objectives.

2. The Fisheries Resource Today

Ontario has a large and diverse aquatic resource with over 250,000 **lakes** and countless **rivers** and streams. Fish benefit Ontario's ecology and ecosystems, as well as its cultures and economy. The province's inland and Great Lakes fish communities provide a diverse range of year-round recreational, commercial and First Nations and Métis fisheries. Together, these activities and their supporting industries are estimated to contribute more than $2.5 billion annually to Ontario's economy (see text box, page 7).

ABORIGINAL FISHERIES

Fish are of central importance to **Aboriginal peoples** in Ontario. Throughout the province, Aboriginal peoples have constitutionally-protected Aboriginal and treaty rights to fish for food, and for social and ceremonial purposes. There are also several Aboriginal **commercial fisheries** across Ontario, most of which stem from historical practice. Aboriginal commercial fisheries are found primarily on the Great Lakes, Lake Nipissing, Lake Nipigon, and lakes of northwestern Ontario.

The history of Aboriginal fisheries pre-dates the existence of the province. Harvest traditionally occurred year round, including during spawning times. Harvesting tools included weirs, nets, traps, spears and baited hooks. Although tools have evolved over time, fishing continues to play a significant role in the lives of Aboriginal peoples, contributing to the dietary, social, cultural and economic needs of communities in Ontario today.

The Constitution Act, 1982 recognizes and affirms Aboriginal and treaty rights of the Aboriginal peoples of Canada. MNRF has a legal duty to consult Aboriginal communities when any proposed activity or decision may adversely impact those rights. With respect to fisheries, the courts have clarified that conservation of fishery resources is the first priority, after which existing Aboriginal and treaty rights take priority before **allocation** and management of the resources for recreational, commercial food and **bait fisheries**.

Aboriginal communities also have a long history of, and strong interest in, fisheries resources management. **Aboriginal Traditional Knowledge** (ATK) has been gathered by Aboriginal peoples through generations of depending on the land and water resources for their survival and way of life. Aboriginal rights and interests help guide fisheries management planning and activities in Ontario. MNRF acknowledges the importance of ATK in decision making and continues to explore opportunities to increase Aboriginal involvement in fisheries management through collaborative partnerships. Far North planning is an example of how the best available information from all sources, including ATK and scientific information, is used to support decision making during the planning process.

Top photo: Largemouth Bass (*Micropterus salmoides*). I. Rayner

Anishinabek/Ontario Fisheries Resource Centre

RECREATIONAL FISHERIES

In 2010, more than 1.2 million resident and non-resident anglers fished in Ontario, more than in any other Canadian province or territory. Although participation in recreational fishing declined somewhat through the last decades of the 20th Century, anglers undertook an estimated 17 million days of fishing activity in 2010.

Today, recreational anglers spend more days fishing on Lake Huron than any other water body in Ontario, followed by Lakes Ontario, Erie, Simcoe and Lake of the Woods. The Ottawa River, St. Lawrence River and Grand River are also popular recreational fishing spots. Many of the province's largest fisheries occur in reservoirs, including the Kawartha Lakes and Lac Seul. Lake Simcoe and Lake Nipissing are the most popular ice fishing destinations.

Walleye is the primary target for recreational anglers on Lake Erie. Rainbow Trout, and Chinook and Coho Salmon are **naturalized species** that dominate the tributary and open water **recreational fisheries** of the other Great Lakes, especially in Lake Ontario and Lake Huron. Coastal wetlands and nearshore warm water embayments of the Great Lakes support recreational fisheries for Smallmouth Bass, Walleye, Yellow Perch, Muskellunge and Northern Pike. Open water recreational fisheries on inland lakes preferentially target Walleye, followed by Bass and Northern Pike. Walleye, Yellow Perch, Northern Pike and Lake Trout are the most preferred species in winter ice fisheries.

Fishing is a key tourism driver in Ontario, with a large number of international anglers attracted to the Great Lakes and the pristine waters of northern Ontario. Of the approximately 1,600 resource-based tourism sites in Ontario, nearly 1,140 are not accessible by road, are located in northern Ontario, and attract 90% of fishing-focussed visitors. These remote tourism fisheries are a key economic component in many northern communities, generating more than $100 million in revenues every year.

ONTARIO'S FISHERIES: SIGNIFICANT CONTRIBUTORS TO THE ECONOMIC AND SOCIAL FABRIC OF ONTARIO

- A significant contribution to the lives of First Nations and Métis peoples.
- 41,000 person years of employment annually.
- More than 1.2 million recreational anglers, contributing $2.2 billion annually to the Ontario economy.
- Nearly $37 million annually in licence sales flow to the Fish and Wildlife Special Purpose account, used exclusively for managing fish and wildlife in Ontario.
- 1,600 tourist operators generating hundreds of millions in revenues annually.
- More than 600 active commercial fishing licences, contributing more than $230 million to the Ontario economy.
- Approximately 1200 commercial bait fishing licences are issued annually, an industry valued at more than $20 million.

COMMERCIAL FOOD FISHERIES

Ontario's commercial food fishery is part of our heritage and culture, and is the largest freshwater fishery in North America. Most commercial food fishing takes place on the Great Lakes, where Rainbow Smelt, Yellow Perch, Walleye and Lake Whitefish make up approximately 80% of harvest by weight. Lake Erie accounts for approximately 75% of that commercial harvest. Substantial commercial fisheries also exist on several large inland lakes, such as Lake of the Woods, Lake Nipigon and Lake Nipissing, with less significant fisheries on some of the smaller inland lakes in northwestern and eastern Ontario. The majority of commercial fishing licences are in northwestern Ontario, where fisheries mainly target Lake Whitefish, with smaller harvests of other species. On Lake Nipissing, Walleye is the primary target species; in southeastern Ontario, a variety of warm water species are harvested. Approximately 10% of the commercial fish harvest is sold in Canada, and 90% is exported primarily to the United States, and a small proportion to Europe.

There are nearly 650 active commercial fishing licences in Ontario, of which 160 are held by First Nations communities, and First Nations and Métis individuals. In 2011, commercial licence holders caught nearly 12,000 metric tonnes (about 12 million kg) of fish. The dockside value of that harvest in 2011 was more than $33 million and, including processing,

packaging, and shipping, contributed approximately 1,000 jobs and $234 million to Ontario's economy. Commercial fishing and its industries are significant employers in many smaller Great Lakes communities, and are an important economic development initiative for many Aboriginal communities across the province.

COMMERCIAL BAIT FISHERIES

Approximately 60% of anglers in Ontario use live baitfish, supporting the largest live baitfish industry in Canada. Approximately 1,200 commercial bait licences are issued every year, representing an industry worth over $20 million annually. The bait industry harvested approximately 144 million fish in 2010. Of these, 60% or approximately 86 million were not identified to species but were simply recorded as "baitfish" (mixed bait species). Among the remaining 40%, Emerald Shiner made up the majority, with over 58 million harvested; and approximately 90,000 Cisco were also harvested. Leeches are also an important bait species, with over 26 million harvested commercially in 2010.

Bait harvesting occurs throughout the province, with the bulk of the "baitfish" and Emerald Shiner harvest coming from southern Ontario, particularly from Lakes Simcoe and Erie. Most Cisco come from across northern Ontario, and most leeches come from northwestern Ontario.

STATUS OF ONTARIO'S FISHERIES RESOURCES

Ontario has the highest fish diversity in Canada, with 128 species **native** to the province and 17 naturalized species. These self-sustaining wild fish stocks provide for a diverse range of year round First Nations, Métis, commercial and recreational fisheries in urban, rural and remote areas of Ontario.

Inland Waters

Populations of warm water and most cool water species are generally stable across the province. Walleye abundance is relatively high in most of northern Ontario, but in southern Ontario, lower abundance is a result of factors such as higher exploitation and competition from aquatic **invasive species**. Smallmouth Bass and Northern Pike are abundant across Ontario. Although Smallmouth Bass are native in much of southern Ontario, their range has expanded through **introductions** and migrations into central and northern Ontario lakes and rivers outside their natural range.

Golden Shiners (*Notemigonus crysoleucas*). A. Drake

Smallmouth Bass fisheries are managed to provide social and economic benefits to Ontarians where appropriate, but efforts are also being made to prevent new introductions, especially in areas where negative interactions with Lake Trout and Brook Trout could occur.

Coldwater species are still widespread across their Ontario ranges but some local populations of Lake Trout and Brook Trout are now **extirpated**, and others have suffered declines. Excessive exploitation has undeniably played a key role in this, but aquatic invasive species and human-caused changes in habitat have also had detrimental effects. Efforts to restore self-sustaining populations of Lake Trout are underway in a number of areas and are showing varying degrees of success. Lake Trout and Brook Trout populations in sparsely populated areas of northwestern Ontario are currently the least impacted by exploitation and other **stresses**, but these populations could also experience the greatest impacts of **climate change**.

Great Lakes

With the exception of Lake Erie, where Walleye was and remains the principal predator, the deep offshore areas of the Great Lakes were once dominated by two main predators, Lake Trout and Burbot, with abundant Lake Whitefish and ciscoes providing the forage base. Those offshore fish communities have experienced drastic changes since European settlement, and many native Lake Trout, Lake Whitefish and Cisco stocks were lost. Atlantic Salmon,

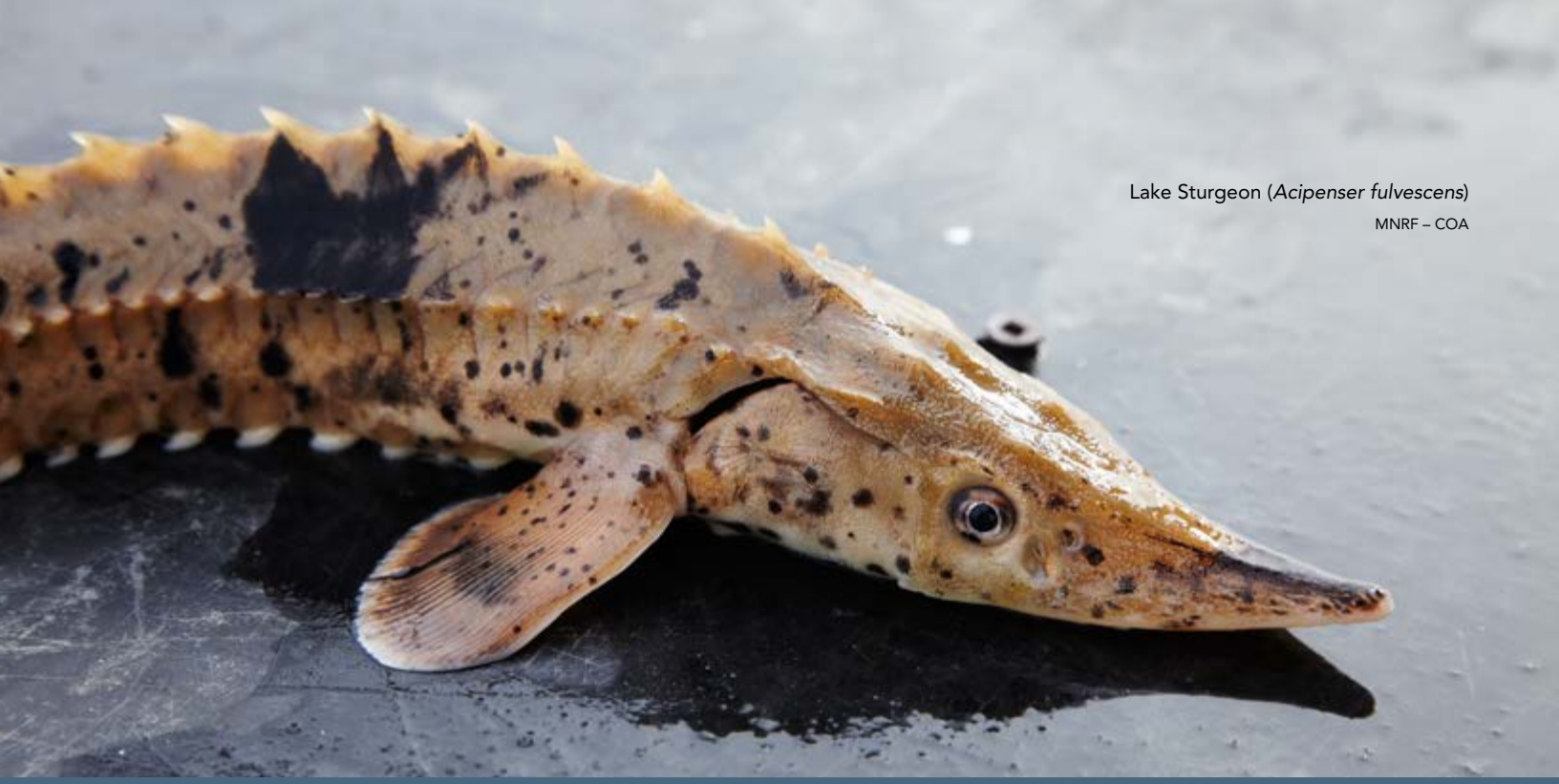
native to Lake Ontario, were also common until the late 19th century. The combined effects of environmental degradation of tributary streams, ecosystem changes in the lake, and overfishing led to the extinction of the Lake Ontario population. **Control** of the invasive Sea Lamprey, improved water quality, and focussed species and habitat **rehabilitation**, combined with successful salmon and trout stocking programs, have helped to rehabilitate these ecosystems. Naturalized Rainbow Trout, and **hatchery-dependent** populations of Chinook and Coho Salmon, now dominate the open water fish communities, especially in Lake Ontario. Lake Superior is still dominated by Lake Trout, Burbot and ciscoes, and rehabilitation efforts have helped Lake Trout re-establish as a keystone predator in Lake Huron.

Lake Erie, and the coastal wetlands and nearshore, warm water embayments of the other Great Lakes, support abundant fish communities composed of a variety of cool and warm water species. Walleye continues to be the most dominant predator in Lake Erie, foraging primarily on Yellow Perch. A number of locations around the Great Lakes have experienced significant habitat loss. In addition, historical pollution has led to increased contaminant concentrations in fish flesh and associated fish consumption advisories. Rehabilitation of habitat and improved water quality in coastal areas such as Toronto's waterfront, Wheatley Harbour, Severn Sound and Collingwood have resulted in the recovery of nearshore fish populations such as Walleye, bass and Northern Pike, and reduced contaminant levels in fish. These areas have seen improvements because they are Great Lakes Areas of Concern and have received focussed government and community attention.

Although significant successes were achieved in restoring and protecting the Great Lakes in the 1970s, 80s and 90s, today's pressures are overwhelming some of those gains. The **cumulative impacts** of human population growth and associated development, continued loss of fish and wildlife habitat, species invasions, new chemicals of concern, water level fluctuations and algae blooms have resulted in declines of native Great Lakes fish species and associated losses in commercial and recreational fishing opportunities. The waters and fisheries of Lake Superior are generally in good condition due to that lake's larger size and relatively lower development pressure, but many indicators of lake health suggest that Lakes Huron, Ontario and Erie are in decline. For example, the number of Ontario's aquatic **species at risk** is growing. Of Ontario's 27 fish and 13 mussel species at risk, most occur in the Great Lakes and their tributaries. In response, the province has developed Ontario's Great Lakes Strategy that sets out a vision, goals and priorities to help restore, protect and conserve the Great Lakes. The government has also proposed a new *Great Lakes Protection Act* to empower action by all partners on Great Lakes, to protect and restore the waters, beaches, and coast areas of the Great Lakes, and to conserve biodiversity, deal with invasive species, and address the need for **climate change adaptation**.

In summary, although a variety of stresses have affected the ecology and fish communities of Ontario's lakes, rivers and streams, Ontario still offers a diverse array of fishing opportunities. Most freshwater fish species that support fisheries are self-sustaining and secure from a conservation perspective, and in some areas, especially northern Ontario, fisheries are thriving. While these gains are encouraging, continued vigilance is critical if we are to protect what we have, and restore and rehabilitate degraded populations and aquatic ecosystems.

MNRF – COA



Lake Sturgeon (*Acipenser fulvescens*)
MNRF – COA

3. Key Trends and Emerging Issues

Ontario is a different place than when the Strategic Plan for Ontario Fisheries II (SPOF II) was released in 1992. The province's population, economy, and environment have all changed dramatically in the intervening years, altering the location and nature of pressures on fisheries resources.

Recognizing these forces, MNRF conducted an environmental scan as a means of understanding the key trends and emerging issues affecting Ontario's fisheries resources. Table 1 provides a summary of the results of that scan.

Table 1: Major drivers affecting Ontario's fish, fisheries, and supporting ecosystems.

TYPE OF DRIVER	THREATS/PRESSURES	OPPORTUNITIES
Economic	• Reduced licence sales result in less revenue for fisheries management into the Special Purpose Account (SPA) for MNRF. • An ageing demographic is reducing participation in remote-based tourism. • International movement of people and goods facilitates introduction of invasive species and pathogens. • Fiscal constraint at the federal and provincial level results in decreased government spending on natural resources management. • Fisheries are a lower priority for government investment than health care and education, a situation that is exacerbated during periods of economic downturn. • Government and stakeholder efforts to increase participation in angling for economic and social benefits could result in increased pressure on the resources.	• Improving U.S. economy and lower Canadian dollar increase opportunities to rejuvenate fishing-related tourism. • Growth of the international middle class may offer potential for new fishing-related tourism markets. • Increased within-province travel by Ontarians may provide opportunities to increase the contribution of fisheries to local economies. • Fishing can provide an affordable food source and/or recreational opportunity for Ontarians. • There are increased opportunities for public/private partnerships as companies try to brand themselves as environmentally friendly, to respond to market drivers.

Table 1 continued

TYPE OF DRIVER	THREATS/PRESSURES	OPPORTUNITIES
Social	• Changing demographics and increased urbanization will alter participation rates and associated economic and social benefits in different ways across the **landscape**, creating uncertainty about the number of anglers and pressure on local fisheries resources. • Population growth creates increased development pressure and demand for resources, in turn causing an increase in resource extraction activities (mines, water taking), infrastructure construction (e.g., roads, dams), and associated habitat alteration and fragmentation. • Urban population growth increases the likelihood of incompatible values and viewpoints associated with resource use and management of fisheries resources. • Competing recreational uses (swimming, boating) and increasing shoreline development reduce opportunities for solitary angling and enjoyment of nature. • Access to the shoreline and therefore to fisheries is decreasing because of private shoreline ownership and liability concerns on public lands.	• There are opportunities to encourage provisions for fish passage and healthy environmental flows as development proceeds. • "Put-grow-take" stocking of ponds and small lakes (often near urban centres) with sport fish creates local fishing opportunities where none exist, deflecting fishing pressure from more sensitive ecosystems and native fish species. • Stakeholders are effective partners, well informed and actively involved in decision making processes: potential to increase capacity for natural resources management. • The trend toward healthy, local food increases the number and diversity of those with an interest in fisheries and their management. • Aboriginal communities are interested in increasing their involvement in fisheries management, increasing the potential to build capacity for natural resources management. • Selective harvest and catch and release fishing increase sustainable fishing opportunities. • There are opportunities to maintain and increase public access sites to water bodies across the province through working with partners and municipalities.
Technological	• Stakeholders expect communication at a rapid pace and delivered through a variety of mechanisms. • Communication among anglers via social media can increase pressure on local resources. • Technological advances make anglers more efficient in fish capture.	• Social media offers a powerful tool for service delivery, education and outreach. • New technologies increase monitoring efficiency and facilitate monitoring at broader scales. • There are opportunities to engage the public through citizen science that makes use of technological advancements.
Policy and Legislation	• Recent changes to the federal Fisheries Act and Navigable Waters Protection Act (now known as the Navigation Protection Act) redefine the overarching legislative approach, and increase emphasis on fisheries management objectives and protecting recreational, commerical and Aboriginal fisheries, rather than fish habitat of all species. • There is potential for increased harvesting demands or challenges related to resource allocation across diverse users as Aboriginal and treaty rights continue to be defined. • Expectations for government transparency and accountability are increasing.	• Governments looking to reduce duplication and costs provide opportunities to modernize policy and legislation. • A modernized policy and management framework creates a strong foundation for the future, including transition to landscape scale management, risk-informed decision making, adaptive management, and policy focus on biodiversity and species at risk. • There are opportunities for streamlining across multiple levels of government to find efficiencies in processes while maintaining environmental **protection**.

Table 1 continued

TYPE OF DRIVER	THREATS/PRESSURES	OPPORTUNITIES
Environmental	• Invasive species, including invasive fish species, fish diseases, invertebrate species, and plants, alter aquatic ecosystem composition, structure, and function. • Climate change may shift the range of cool and warm water species northward to the detriment of cold water species. • In a warming climate, the potential for increased fishing opportunities over a longer open-water fishing season could result in increased pressure on fisheries resources. • Climate change and other environmental disturbances increase vulnerability to invasive species and pathogens, extend the range of aquatic invasive species, and exacerbate shifts in community and food web composition. • Climate change will increase the likelihood of extreme weather events, and thus the potential for ecosystem changes during high flows or drought. • Water quality impairment from point and nonpoint sources of pollution (e.g., nutrients such as phosphorus, sediment, and organic and inorganic contaminants such as heavy metals) creates stress on fish populations. • The cumulative impacts of stressors such as water quality impairment; habitat change, loss, or fragmentation; infrastructure development (e.g., roads, dams, bridges); and climate change have the potential to impact fisheries, especially in areas adjacent to the Great Lakes where urbanization is most intense.	• A warming climate creates the potential for increased fishing opportunities and associated benefits over a longer open-water fishing season • There is potential to diversify fishing opportunities, particularly for non-traditional species and those that benefit from climate-change scenarios. • Broad-scale pressures such as climate change and cumulative impacts of multiple stressors create province-wide opportunities for new monitoring, science, and information management partnerships.

Several points emerge from this environmental scan. First, certain drivers, especially population growth, demographic trends, and the location and nature of fishing interests, are difficult to predict with certainty but will continue to pose challenges for fisheries management. Invasive species and climate change are the most significant and growing concern for fisheries. Climate change will bring a suite of complex effects including changes in food web structure and the timing and success of fish reproduction; more frequent extreme weather events (and thus increased likelihood of habitat disruption); more invasive species; and greater susceptibility to native and non-native pathogens. These drivers operate at broad spatial and temporal scales, well beyond the level of a local stream or lake, and must be understood and managed accordingly. Uncertainty is high, and the **knowledge** base is still evolving. There is therefore a need for adaptive management, periodically revisiting and revising management objectives and strategies as information about stressors and environmental response improves.

These and other major changes in Ontario's environmental, social, political, and economic conditions over the last two decades signal the need for this new strategic plan for the province's fisheries. The following sections describe the strategic planning context; fisheries management roles, responsibilities and management approaches; and the goals, objectives and tactics of this *Provincial Fish Strategy*.

MNRF – Learn To Fish Program

4. The Current Strategic Planning Context

Ontario's Provincial Fish Strategy: Fish for the Future builds on the legacy of over forty years of fisheries strategic planning, providing a practical framework to guide MNRF's management of the province's fisheries resources. It is guided by other MNRF strategic direction, including *Our Sustainable Future: A Renewed Call to Action* (2011); *Biodiversity: It's In Our Nature* (2012); *MNRF's Statement of Environmental Values* (SEV); the *Joint Strategic Plan for Management of Great Lakes Fisheries*, and the guiding principles that derive from these documents (Figure 1, page 14).

This *Provincial Fish Strategy* is consistent with the description of MNRF's core mandate – to conserve biodiversity and manage natural resources in a sustainable manner – and with the organizational goals articulated in MNRF's Strategic Direction:

- Ontario's ecosystems withstand pressures and threats;
- Ontario's natural resources contribute to sustainable economies and ecosystems;
- A trusted and accessible source of knowledge about Ontario's natural resources;
- People, property and natural resources protected from **hazards**;
- Ontarians are actively involved in achieving biodiversity conservation and **sustainable use**; and
- Trusted by Ontarians to deliver results with an enthusiastic and engaged workforce.

The Provincial Fish Strategy embraces a landscape approach to fisheries management, consistent with MNRF policy direction outlined in *Taking a Broader Landscape Approach – A Policy Framework for Modernizing Ontario's Approach to Natural Resource Management* (2013), and provides direction on how the approach will be applied in the context of fisheries management.

Lake Whitefish (*Coregonus clupeaformis*). MNRF – COA

Figure 1. Ontario's Provincial Fish Strategy provides the link between high level strategic direction and the various tools and activities used to manage Ontario's fisheries.

5. Roles & Responsibilities for Fisheries Management

LEGISLATIVE AND POLICY FRAMEWORK

Under Canada's *Constitution Act*, responsibility for fisheries management is divided between the federal government, which has authority over the seacoast and inland fisheries, and the provinces, which have authority over natural resources, management and sale of public lands, and property and civil rights. At the federal level, Fisheries and Oceans Canada (DFO) has primary responsibility for fisheries; in Ontario, the primary agency is MNRF. Other agencies and levels of government also have mandates that include aspects of fisheries management. Examples include Transport Canada (federal), the Ontario Ministry of the Environment and Climate Change (MOECC), Ontario's Conservation Authorities, national and provincial parks, and municipalities.

This discussion of roles and responsibilities reflects the best available information at the time of writing. It is important to note that these arrangements may change over time with changing ministry portfolios and in response to emerging issues.

The protection of **fish** and **fish habitat** is a responsibility of the federal government. DFO uses the federal *Fisheries Act* to protect fish and fish habitat, ensure passage of fish, and prevent pollution that can have detrimental impacts on fish populations. The 2012 amendments to the Act have shifted its focus to providing for the sustainability and ongoing productivity of commercial, recreational, and Aboriginal fisheries (including habitat and the fish that support them), as opposed to protecting the habitat of all fish.

DFO has created a *Fisheries Protection Policy Statement* that outlines how DFO and its regulatory partners (including MNRF) will apply the Fisheries Protection Provisions of the *Fisheries Act*, guide the development of regulations, standards and directives, and provide guidance to proponents of projects on the application of the Fisheries Protection Provisions of the *Fisheries Act*.

Top photo: Chinook Salmon (*Oncorhynchus tshawytscha*). J.D. Taylor

MNRF

Section 35 of the Fisheries Protection Provisions of the *Fisheries Act* prohibits serious harm to fish and applies to fish and fish habitat that are part of or support commercial, recreational or Aboriginal fisheries. Serious harm to fish is defined in the Act as "the death of fish or any permanent alteration to, or destruction of, fish habitat." When issuing a Section 35 authorization, DFO must consider the following four factors (outlined in Section 6 of the Act):

a) the contribution of the relevant fish to the ongoing productivity of commercial, recreational or Aboriginal fisheries;

b) fisheries management objectives;

c) whether there are measures and standards to avoid, mitigate or offset serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or that support such a fishery; and

d) the public interest.

MNRF is the agency responsible for administering and enforcing the Ontario Fishery Regulations under the *Fisheries Act*, including allocation and licensing of fisheries resources, fisheries management (e.g., control of angling activities and stocking), fisheries management planning, fish and fish habitat information management, and fish habitat rehabilitation. Ontario works with DFO to help achieve the requirements of the *Fisheries Act* through agreements and protocols. The *Fish Habitat Referral Protocol for Ontario* is currently being updated to reflect the recent changes to the *Fisheries Act*.

The ministry also has fisheries responsibilities under the federal *Aboriginal Communal Fishing Licences Regulations*, and the Ontario *Fish and Wildlife Conservation Act*. Under Ontario's Environmental Bill of Rights, MNRF is required to consider the ministry's Statement of Environmental Values in evaluating each proposal for instruments, policies, statutes, or regulations that may significantly affect the environment.

Other federal and provincial laws and national and international agreements also touch on the management of fish, fisheries and their supporting ecosystems in Ontario. Examples include the *Ontario Lakes and Rivers Improvement Act*, the *Crown Forest Sustainability Act*, the *Public Lands Act*, the *Provincial Parks and Conservation Reserves Act*, the *Environmental Assessment Act* and the *Planning Act*. For example, under the *Crown Forest Sustainability Act*, forestry operations must follow Forest Management Plans and adhere to site-specific environmental protection requirements in and around water to protect fish habitat. Another example is land use planning for Crown lands, a process that is led by MNRF under the authority of the *Public Lands Act*, and guided by the *Crown Land Use Policy Atlas*. This planning includes establishment of broad direction for resource-related activities and road access, both of which may impact fisheries and aquatic ecosystems. A last example is the Provincial Policy Statement (PPS), issued under the *Planning Act*, which integrates all provincial ministries' land use interests related to municipal planning and development. While the Ministry of Municipal Affairs and Housing (MMAH) has overall responsibility for the PPS, MNRF has the lead for policies and the provision of technical advice regarding the protection of fish habitat, through the *Natural Heritage Reference Manual*.

FISHERIES MANAGEMENT TOOLS

MNRF's mandate is delivered through statutes, regulations, policy, planning, program development and program delivery. A variety of fisheries management tools are available, and the right tool for one job may not be ideal for another:

- **Fisheries management planning:** Fisheries management planning provides guidance for managing fisheries at multiple spatial and temporal scales. Planning is focussed on ensuring the sustainability of fisheries and informs the allocation of fisheries resources within the planning area to provide a range of social, cultural and economic benefits.
- **Regulation of commercial and recreational fisheries:** Under the authority of the *Fisheries Act*, MNRF issues licences via the *Fish and Wildlife Conservation Act* for various fisheries activities in Ontario: commercial food and bait fisheries, recreational fishing, stocking, **aquaculture**, and the collection of fish for scientific purposes. Licence conditions can set limits on those activities or outline measures to minimize any unintended impacts of those activities. One of the best-known tools for managing self-sustaining fisheries is setting fishing regulations to control how many, where, and how fish are harvested. Regulations can include seasons, creel limits or quotas, and size restrictions for recreational and commercial fisheries.
- **Fish stocking** is an important fisheries management tool. Fish that are raised at MNRF's nine fish culture stations and community hatcheries are stocked to create Put-Grow-Take (PGT) fisheries that provide additional angling opportunities. In certain situations, stocked fish may help to restore degraded fish populations. MNRF is currently developing strategies for culturing and stocking aquatic species at risk, in support of **recovery** efforts for those species.
- **Fish habitat protection:** Sustainable fisheries require a diversity of fish communities supported by healthy aquatic ecosystems and associated fish habitat. DFO has the primary responsibility for the protection of fish habitat under the Fisheries Act (Parks Canada manages fish habitat in national parks, national marine conservation areas, and the national historic canals). As a partner in these efforts, MNRF develops guidelines and best management practices and works with MMAH to provide advice to municipalities on how to protect fish and fish habitat through municipal land use planning. MNRF also incorporates fish and fish **habitat protection** into its own land-use and resource management plans.
- **Fish habitat rehabilitation:** In Ontario, MNRF is the provincial agency responsible for fish habitat rehabilitation. MNRF may also actively participate in habitat rehabilitation activities, either alone or through partnerships.
- **Research and monitoring** are key components of MNRF's commitment to science-based decision making. These activities provide critical information on the status of fisheries, fish communities and supporting aquatic ecosystems, and thus support the evaluation of fisheries management actions over time.
- **A risk-based framework for compliance and enforcement planning** supports fisheries management by focusing efforts on areas of highest risk to fisheries resources. This approach helps to ensure compliance with fisheries legislation in areas where threats are greatest or the resources most need protection.

Brook Trout (*Salvelinus fontinalis*). MNRF

MNRF Assessment Boat, Atigamyg. MNRF

GREAT LAKES FISHERIES MANAGEMENT:
BI-NATIONAL MANAGEMENT OF A SHARED RESOURCE

Fisheries management decisions can have effects on the whole system, well beyond individual jurisdictional boundaries. For that reason, a coordinated and integrated approach is essential for effective management of the Great Lakes. This coordination takes place under the auspices of the Great Lakes Fishery Commission (GLFC), established in 1955. All state, provincial, federal, and tribal natural resource management agencies in the **Great Lakes basin** are signatories to the Joint Strategic Plan for Management of Great Lakes Fisheries. Individual lake committees, that comprise representatives from each agency, implement the strategic plan. For example, bi-national **Fish Community Objectives** for each of the Great Lakes specify lake-wide fish community goals and objectives that are achieved through management programs (such as stocking and regulations) that are developed and implemented by individual jurisdictions.

While MNRF has clear responsibilities related to fisheries management in Ontario, it is equally clear that the ministry must depend on other agencies such as DFO, MOECC, and Conservation Authorities to successfully deliver its mandate, especially in the role of protecting the aquatic ecosystems on which fish populations depend. Other forces and decisions outside MNRF, for example, those related to Aboriginal and Treaty rights, environmental assessment processes, or judicial (court) decisions, will also affect the ways that fisheries are managed in Ontario.

For border waters with shared jurisdiction, MNRF relies on good working relationships with neighbouring provincial and state agencies, and co-operative efforts through bi-national groups such as the Great Lakes Fishery Commission (see text box, this page). In addition to agency partnerships, MNRF also depends on the people of Ontario to act as responsible stewards of the fisheries resources. Planning for, and protecting Ontario's fisheries resources is a shared stewardship responsibility.

American Eel (*Anguilla rostrata*). K. Punt

6. Key Management Approaches

MNRF manages natural resources and their use across Ontario's diverse ecosystems, addressing regional and local differences in social, economic and ecological objectives. This requires the integration of management objectives and approaches for many species and their habitats, in the context of varied human activities and multiple stressors.

An **ecosystem-based approach** to management has long been advocated as the best way to address the complex resource management challenges associated with diverse and complex landscapes, whether terrestrial or aquatic. Moving toward an ecosystem-based approach to managing Ontario's fisheries resources will mean shifting management to broader spatial scales, over longer time periods. It also requires acknowledgement of uncertainty. One of the greatest challenges of natural resources management is the absence of complete knowledge of natural systems. Decisions must therefore be based on the best available science and knowledge, and reviewed periodically as the knowledge base improves. The Precautionary Principle guides this process (see text box, page 20).

It is challenging to balance the economic and social benefits of development with fisheries and ecosystem goals. In some cases, decisions made outside of MNRF's mandate have consequences for provincial fisheries. A structured and inclusive decision-making process can help to clarify the local context and ensure that risks and benefits to the resources and its users are well understood. Such an approach can also help to integrate fisheries planning with other relevant planning processes where possible, and inform the development of appropriate **mitigation** measures where impacts cannot be avoided.

MNRF is also committed to continuous improvement of natural resources management outcomes and understanding of aquatic ecosystems. To this end, the ministry endorses the use of a landscape-scale, risk-informed and adaptive approach to management wherever possible. These approaches are reflected in the *Strategy*'s Guiding Principles (see Section 6). Their application to fisheries management is described in more detail in the following paragraphs.

Top photo: Brook Trout (*Salvelinus fontinalis*). R. MacGregor and N. Butala

THE PRECAUTIONARY PRINCIPLE

The Precautionary Principle can be thought of as a "better safe than sorry" approach. It states that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent resource degradation.

LANDSCAPE APPROACH: *MANAGING AT APPROPRIATE SCALES*

Adopting a landscape-scale approach to fisheries management promotes better understanding of how natural systems work and how they are affected by human activities. It means taking an ecosystem approach to management and acknowledging that there is a limit to the **natural capacity** of aquatic ecosystems. It also requires that resource management goals and objectives be balanced against other challenges, issues, and needs across the broader landscape.

Generally, a landscape approach means managing over broader spatial scales and over longer time periods, but that is not always the case. Landscapes for managing fisheries in Ontario are defined at multiple spatial and temporal scales (see Figure 2). The most appropriate scale for planning, management and monitoring depends on:

- *Ecological factors*, such as the provincial climate zones, natural hydrological boundaries such as **watersheds**, and fish species distribution patterns
- *The type, status and extent of the resources of interest*, such as the type of fishery, species, and fish community
- The type, extent and intensity of the stress that is being managed, such as habitat alteration, fishing pressure, invasive species, and climate change
- *Social and economic factors* such as population size, demand for fishing, jurisdictional boundaries and road access

J. Inglis

APPLYING THE LANDSCAPE APPROACH IN FISHERIES MANAGEMENT

Many stressors on fisheries, such as fishing pressure, invasive species and climate change, operate at broad scales, well beyond the level of a local stream or lake, and must be understood and managed at the landscape level. In 2008, MNRF moved toward a broader landscape scale approach to managing recreational fisheries by establishing 20 **Fisheries Management Zones** (FMZs) as the primary units for planning, management and monitoring most fisheries in Ontario. The boundaries of the FMZs were determined using a combination of ecological factors, such as watershed boundaries and climate, and social factors including fishing pressure and road access (see text box, page 23). Management Plans for each FMZ document the desired future state of the fisheries resources, and interpret provincial goals and objectives in the establishment of zone-level and local fisheries objectives and actions. For most recreational fisheries, management actions are applied across the zone, whereas quotas related to inland commercial food fisheries apply to individual water bodies within a zone.

LANDSCAPE-SCALE MANAGEMENT OF LAKE TROUT: DIFFERENT SCALES FOR DIFFERENT STRESSES

Lake Trout is a sensitive coldwater species that also needs high dissolved oxygen in the deep waters of a lake, or hypolimnion. It is vulnerable to many stresses, including high rates of exploitation, acid precipitation, species invasions, eutrophication, and habitat loss. Protecting or rehabilitating Lake Trout populations in the face of these varied stresses can mean applying a combination of different management tools at different scales.

MNRF has developed a science-based provincial policy to evaluate lakeshore development capacity on all inland Lake Trout lakes on the Precambrian Shield. The policy uses a threshold based on a hypolimnetic dissolved oxygen criterion (7 mg/L) to determine if a Lake Trout lake is at capacity for shoreline development. If measured oxygen is below the threshold, or modelling suggests that development could cause that to occur, the lake is considered "at capacity" for development. At the local scale, MNRF encourages municipalities to identify "at capacity" Lake Trout lakes in their Official Plans, consistent with direction in the Provincial Policy Statement. MNRF maintains a formal list of designated Lake Trout lakes that is reviewed and updated periodically.

MNRF has also used a landscape approach and a variety of management tools such as fishing regulations and Lake Trout lake prescriptions for Forest Management Plans at a regional scale. The prescriptions are aimed at preventing unplanned access to natural Lake Trout lakes, while implementing sound forest management practices. The approach allows for additional restrictions on the construction, use, or decommissioning of roads around certain aquatic features such as lakes containing sensitive self-sustaining populations of Lake Trout or Brook Trout. Those decisions are made at the discretion of planning teams in the context of zone-wide fisheries management objectives and strategies developed with the advice of Fisheries Management Zone advisory councils. The hope is that this broader landscape-scale approach will protect sensitive fish populations from over-exploitation and other stressors such as aquatic invasive species.

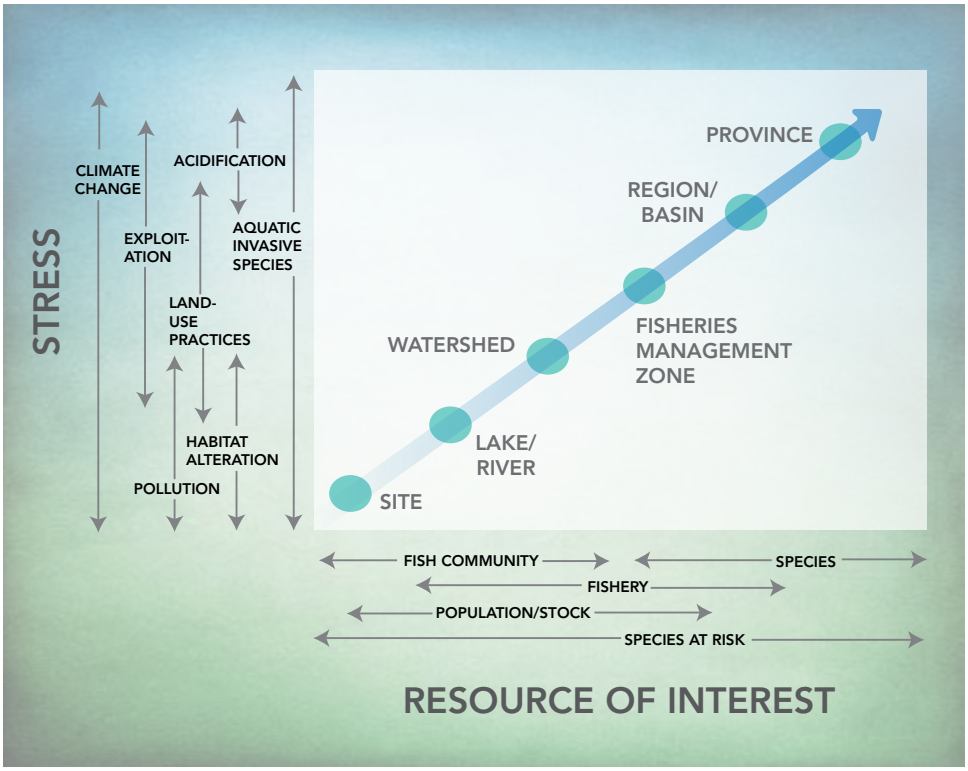


Figure 2. Selecting the right scale of management means understanding how resources and stresses interact on the landscape.

W. Wegman

Each of the Great Lakes is also a FMZ, but in these bi-national systems fisheries are managed at an international scale. The Great Lakes Fishery Commission promotes and facilitates bi-national management of commercial and recreational fisheries on the Great Lakes. Specific fish community objectives for each lake have been jointly agreed upon by the Canadian and U.S. management agencies, including MNRF. In terms of the commercial fishery, each Great Lake is partitioned into quota management zones. Within the Canadian waters of each lake, MNRF issues licences, sets annual individual species catch quotas, and monitors harvests by commercial fishermen within quota management zones. Quotas are adjusted periodically as part of an adaptive management strategy.

Fisheries Management Zones also exist in the Far North, but fisheries planning mechanisms and processes are not yet well defined. Management of fisheries presents a challenge because of the vast and sparsely populated geographic area. In this region, it is especially important to involve First Nations and Métis communities and stakeholders in the planning and management of fisheries. In some areas, integration of fisheries management planning with community planning is already underway.

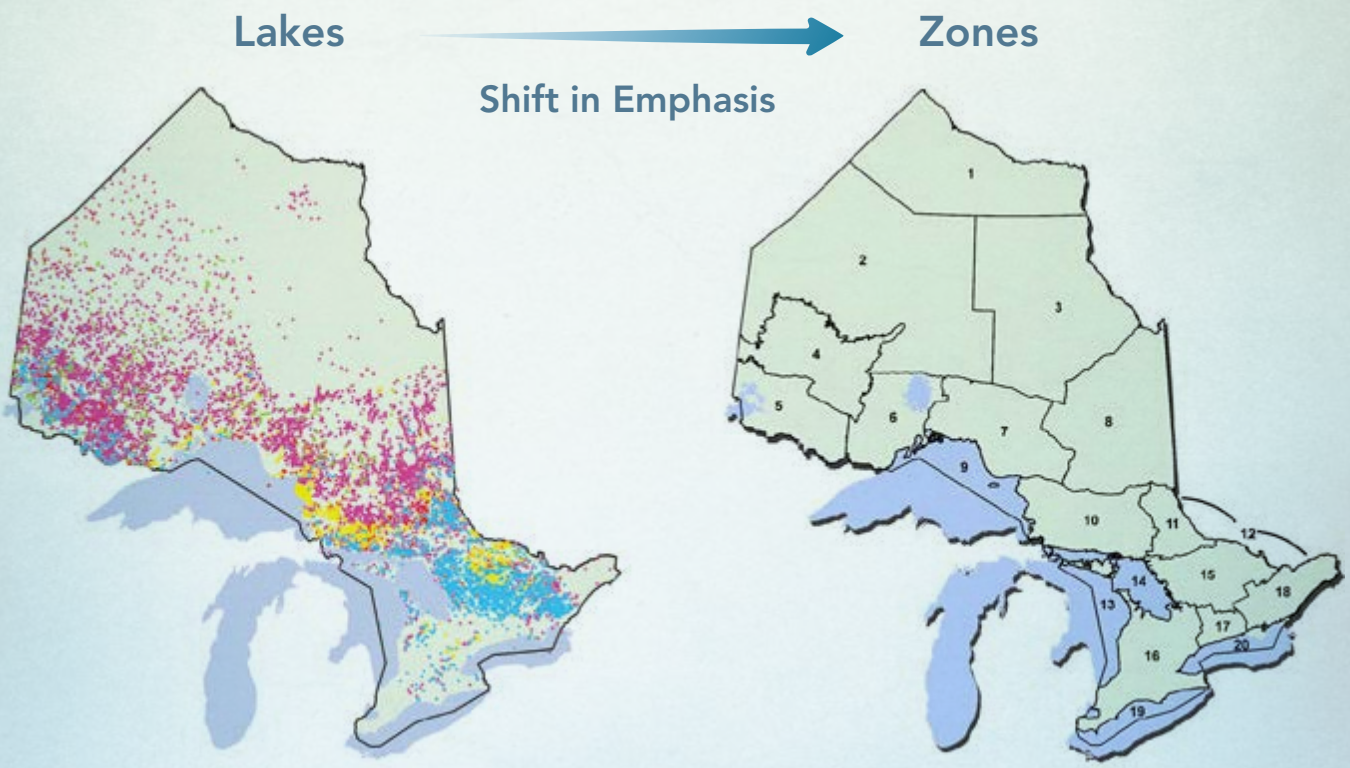
Although the primary focus of fisheries management is at a Fisheries Management Zone scale, fisheries planning and management activities also occur at other scales. Site-specific management occurs most often when mitigating impacts of development or when restoring fish populations and aquatic ecosystems. Sub-zone fisheries management planning can be used at various scales, for example for Provincially Significant Inland Fisheries (PSIFs); for selected urban watersheds with highly valued fisheries or significant resource pressures; and for large parks and **protected areas**.

The decision to undertake sub-zone planning depends on the resources of interest, the assessed risk, and the specific management objectives. PSIFs are selected through a risk-informed process, and are managed and monitored individually. Conservation Authorities are actively engaged in the planning and management of individual watersheds, to improve sustainability and prevent loss of fish habitat and productivity related to land and water use. Watershed-Based Fisheries Management Plans (WBFiMPs) are sometimes developed as a companion to a Watershed Management Plan, and provide a framework to guide the protection, rehabilitation and enhancement of fisheries resources in a watershed.

Managing Recreational Fisheries at a Landscape Scale

Historically, recreational fisheries management occurred across 37 Fishing Divisions, but by the early 1980s, local managers recognized that the resource was suffering and new approaches were needed. To address the issue, they developed individual lake regulations, and focussed the management and monitoring of fisheries resources on individual lakes. The number of regulations increased exponentially, and it was soon apparent that the approach was both costly and ineffective. In particular, it failed to recognize the mobility of anglers, who move from one water body to another to avoid more restrictive regulations in a given location.

In January 2008, MNRF took a new approach to fisheries planning and management, establishing 20 Fisheries Management Zones (FMZs) to replace the former 37 Fishing Divisions. The new FMZ boundaries are based on ecological factors and angler use patterns, and reflect the province's climate zones, watershed boundaries, fishing pressure, and road networks. These zones are now the unit of management for most fisheries in Ontario, and form the basis for fishing regulations such as catch limits and seasons. Fish communities are monitored and assessed at the zone level. Where higher risk exists, in systems with significant social, economic, or ecological importance (e.g., Lake Simcoe and Lake Nipissing), management still occurs on an individual lake basis.



RISK-INFORMED APPROACH: RECOGNIZING RISK AND UNCERTAINTY

Understanding and managing risk is essential to good fisheries management. In determining acceptable levels of risk, the social, economic, and ecological benefits provided by fish and aquatic ecosystems must be considered. Natural systems are inherently variable, and knowledge of them is never complete. A risk-informed fisheries management approach acknowledges this uncertainty, taking into account the probability and severity of unacceptable outcomes (impacts) when making resource management decisions (Figure 3). Both probability and impact are estimated quantitatively based on the best available scientific, expert and **traditional knowledge**, including social and economic values. **Risk assessment** is one tool, used in combination with others, to help MNRF set priorities to address threats and identify the most vulnerable species, communities and ecosystems. **Vulnerability assessment** supports risk assessment by evaluating the ecological or biological mechanisms that prevent organisms, habitats and/or processes from coping with stress (for example, from a warming climate) beyond a certain tolerance range. It can help fisheries managers identify ways to reduce risks and impacts to fisheries resources and the people that depend on them.

Risk assessment must consider the cumulative effects of past, present and future developments. This is particularly important for fisheries with past or ongoing challenges, those at higher risk, and those of significant social, economic or ecological importance. Cumulative impacts may be additive (for example, the impact of repeated activities in the same area over a period of time) or synergistic (for example, the combined impact of a warmer climate, increasing human development in the watershed, and deteriorating water quality). Cumulative impacts can be challenging to assess, so the Precautionary Principle must be used in evaluating actions or policies with the potential to contribute to cumulative impacts on fisheries.

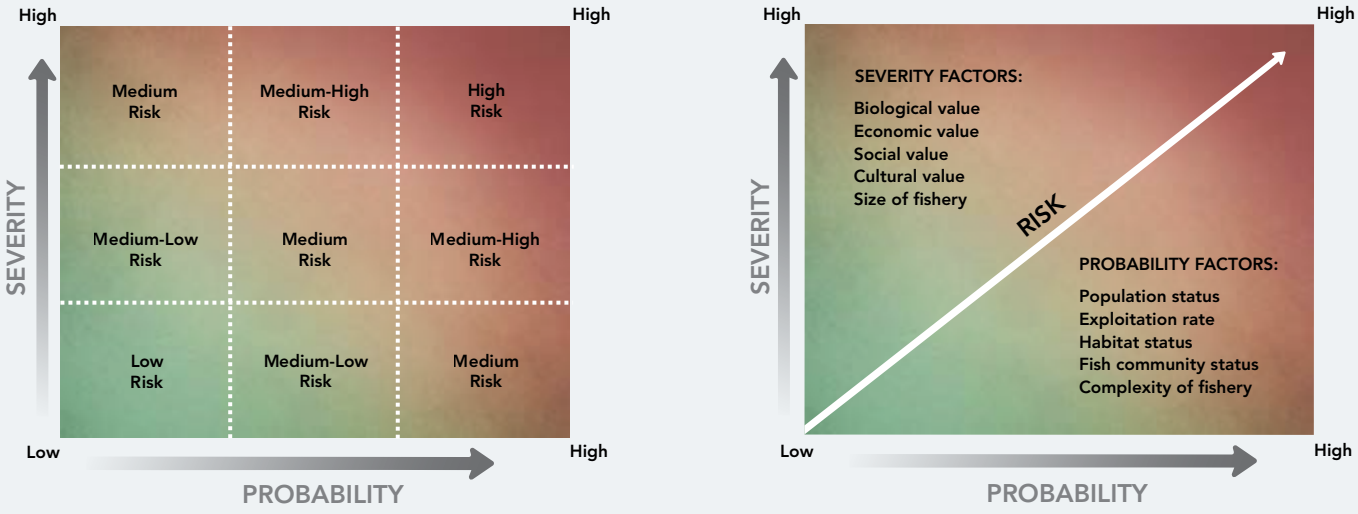


Figure 3.

a) **A simplified risk matrix.** Risk is the product of the severity of an unacceptable outcome and the probability of occurrence of that outcome. As either severity or probability increase, risk becomes greater.

b) **An example of factors used to determine risk to a fishery.** If population status is low or habitat is degraded, for example, the probability of an unacceptable outcome increases. If biological, economic, social, or cultural values are high, the severity of an unacceptable outcome increases.

Ideally, fisheries management decisions should take place in a structured and inclusive risk-informed process, guided by the MNRF Risk Management How-to Guide, to clearly define the factors to be considered and the likelihood and impact of specific outcomes. This process must consider broad landscape (or watershed) patterns and processes, while also being sensitive to the local context. Care must be taken to ensure that healthy resources continue to be protected, and that attention is not directed only to the highest-risk species or areas. Monitoring is particularly important in tracking dynamic ecosystem conditions over wider areas and longer timeframes. Management strategies must be reviewed and adjusted over time, because of the uncertainty inherent in dealing with natural systems.

APPLYING THE RISK-INFORMED APPROACH IN FISHERIES MANAGEMENT

MNRF is currently using a structured risk-informed approach to designate Provincially Significant Inland Fisheries and thus determine the appropriate scale and intensity of fisheries monitoring and management. Key factors considered in the risk assessment include the social and economic value of the fishery, harvest stress, and the cumulative effects of other stressors. While most fisheries planning and management will now occur at the scale of FMZs, significant fisheries such as Lake of the Woods, Lake Nipissing, and Lake Simcoe will continue to be managed individually, through lake-specific objectives and management actions. In some cases, lake-specific monitoring programs may also be required to measure progress toward management objectives, both locally and in the context of the Fisheries Management Zone in which they occur.

Once risk has been assessed, management actions can help to reduce the probability or severity of impacts, and therefore reduce risk. Where impacts cannot be avoided, mitigation may be necessary, and risk assessment can help to inform decision making. A risk-informed mitigation framework incorporates a hierarchy of action:

- **Avoid:** Where possible, impacts should be prevented or avoided, for example by adjusting reservoir water level or flow to reflect the needs of migrating species.
- **Minimize:** When impacts cannot be avoided, they should be minimized in space and over time, for example by adjusting the time period over which a policy might apply.

Muskellunge (*Esox masquinongy*). R. Reyns

- **Mitigate:** In situations where impacts cannot be avoided and steps to minimize losses are not sufficient to meet objectives, mitigation in the form of **restoration**, rehabilitation, or repair is the next preferred option.
- **Compensate:** If residual impacts remain following minimization and mitigation, compensation can be used to replace, provide substitutes, or offset damage and biodiversity losses. For example, under the *Fisheries Act*, compensation occurs in the form of **offsetting measures** taken to counterbalance the residual *serious harm to fish*. Offsetting measures must be focused on improving fisheries productivity, and preference is given to measures that are nearby or within the same watershed.

ADAPTIVE MANAGEMENT APPROACH: *LEARNING THROUGH DOING*

Adaptive management is a structured and systematic process of "learning through doing" – continuously improving management approaches and policies over time. In an adaptive management approach, objectives are clearly articulated, preferred management strategies are implemented, and the system is monitored and evaluated over time. Periodically, results are reviewed and compared against expected outcomes and management strategies are adjusted as necessary to reflect improved understanding of the managed system or altered levels of risk to the resources. This allows managers to recognize and adapt to the uncertainty typical of human and ecological systems, and identify and fill gaps using science, information and local and Aboriginal Traditional Knowledge. Strong monitoring and compliance programs support this approach, ensuring that system condition is tracked regularly and that unintended impacts do not cause serious decline or damage to the fishery. Adaptive management is most successful when meaningful engagement of First Nations and Métis communities and stakeholders occurs at key points throughout the cycle, to provide advice on setting management objectives, reviewing progress against objectives, and adjusting management strategies to improve outcomes. MNRF is committed to meeting its constitutional and other legal obligations in respect of Aboriginal peoples, including the duty to consult.

APPLYING THE ADAPTIVE MANAGEMENT FRAMEWORK IN FISHERIES MANAGEMENT

MNRF has moved toward an adaptive management approach for managing recreational fisheries in Ontario (Figure 4). Fisheries management plans are developed in consultation with advisory councils and committees. Monitoring over the long term at a broad scale, and more intensively where required, is critical in assessing the effectiveness of management actions in meeting objectives. It provides a basis for interpreting results and comparing them to predicted outcomes, and thus guides future actions. The results of monitoring are documented and reported to the public as part of a transparent management approach.

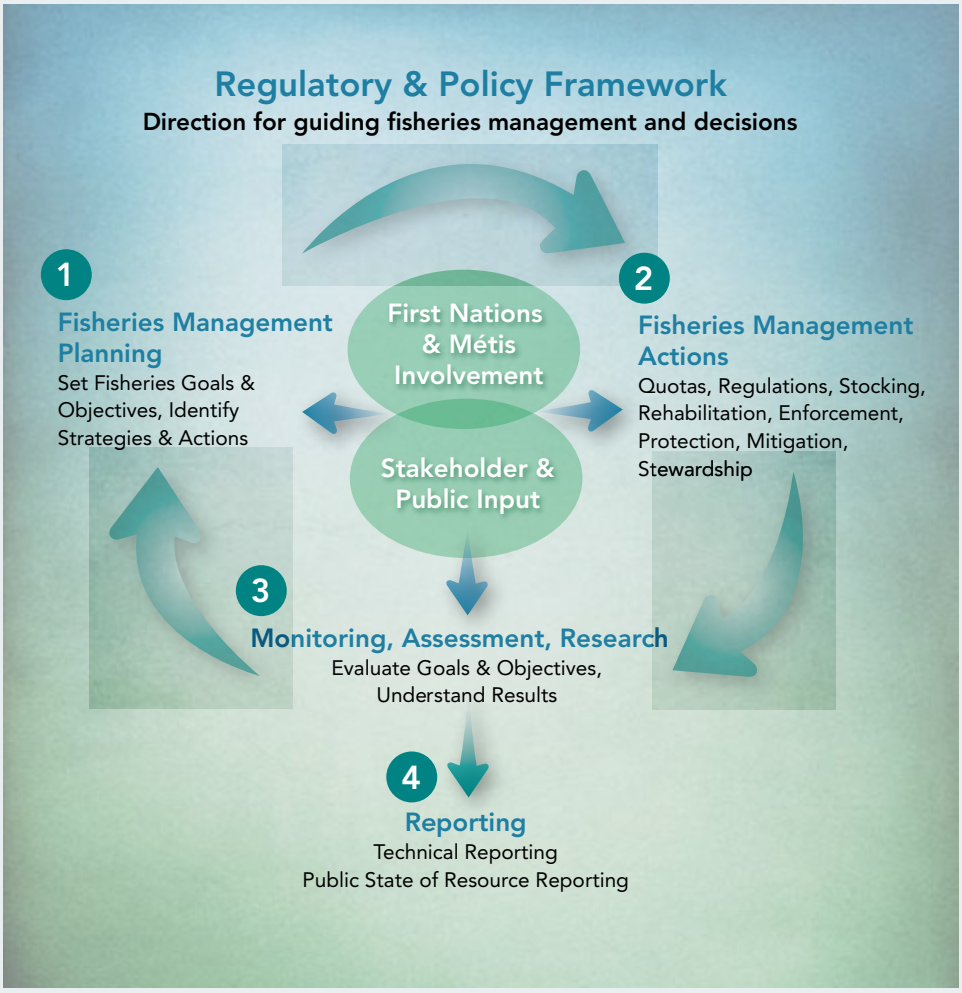


Figure 4: Fisheries management framework within an adaptive management cycle.

For a number of years, MNRF has successfully used adaptive management for commercial fisheries on the Great Lakes. Information provided by commercial fishers through mandatory reporting, combined with independent monitoring data where risks are higher, provides basic information that is analyzed on an annual basis. Fishing quotas are adjusted annually, based on the results of data analyses and input from interested parties, with whom the data and results are shared: commercial fishers, FMZ advisory councils, First Nations and Métis fishers. This adaptive approach allows managers to assess the impacts of changing harvest levels on fish stocks each year, consider **socio-economic factors** that sometimes come into play, and adapt management approaches accordingly.

Indicators and **benchmarks** can be used to assess the state of fish populations, set management objectives, and guide management decisions related to single- or multi-use fisheries on individual lakes or at broader scales. Indicators are the variables that are measured to track progress toward fisheries objectives, for example the measured fishing mortality rate of a fish population, measures of biomass, or the number of age classes. Benchmarks are limits or reference values of the indicator. For example, as a general principle, **Maximum Sustainable Yield** (MSY) is achieved when **fishing mortality** (F) is less than **natural mortality** (M). On an individual water body, the state of a fish population can be assessed by comparing indicator measurements to benchmarks. At a landscape scale, fisheries can be assessed by comparing the proportion of fish populations that meet or exceed benchmarks.

Indicators and benchmarks are powerful tools in adaptive management of fisheries. As exploitation approaches MSY, yields and associated social and economic benefits increase, but the biological risk to the resource also increases (see text box, this page). Input by stakeholders and First Nations and Métis peoples can help to determine the optimum balance between benefits and risks. For example, where the fisheries management objective is to maximize yield, and higher levels of risk can be tolerated, fishing mortality benchmarks can be set close to those at MSY. On the other hand, where the objective is to have a high quality fishery with high catch rates over the long term, the tolerance for risk is lower, and benchmarks can be set well below MSY to maintain high population abundance.

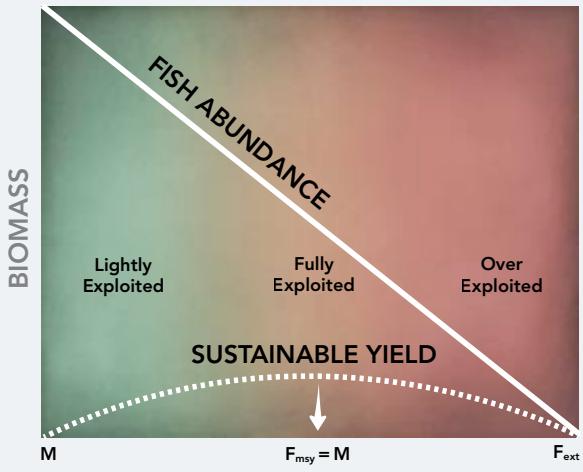
The application of benchmarks to fisheries is still evolving as knowledge of the managed systems improves. For example, defining an appropriate fishing mortality benchmark requires data on the natural mortality rate and other life history characteristics of a species, in addition to its geographic location and the selective harvest management strategies in use. Decision-support tools are also evolving, for instance to help predict the effect of management actions on fishing mortality and define natural mortality rates for harvested species. Development of such tools is a key priority under this *Strategy*.

USING INDICATORS AND BENCHMARKS IN FISHERIES MANAGEMENT: AN EXAMPLE

Total mortality is the combination of natural mortality (M) and fishing mortality (F), and is a key driver of fish abundance. When a population is unexploited, mortality from natural causes (M) controls abundance. Natural mortality rate varies considerably within and among species, depending on the environment in which they live.

Fishing mortality (F) results from exploitation by commercial, recreational or Aboriginal fisheries and is expressed as a single measure. As fishing mortality increases, population abundance declines, and yields increase to a point known as Maximum Sustainable Yield (MSY: the largest harvest that can be sustained over time). The primary goal of fisheries management is therefore to maintain population abundance above the level that produces the MSY. This reduces the risk of overfishing and increases fishing quality over the long term.

The fishing mortality rate at the point of MSY is denoted as $\mathbf{F_{MSY}}$; this is therefore a benchmark against which measured fishing mortality (the indicator) can be compared. If fishing mortality rate exceeds F_{MSY}, yield and fish abundance decline, decreasing the benefits derived from the fishery and increasing the risk of fishing a stock to extinction ($\mathbf{F_{ext}}$). The figure below shows the general relationship between fish abundance, fishing mortality rate and sustainable yield. Both F and M are estimated from monitoring data.



7. Ontario's Provincial Fish Strategy

As noted in the introduction to this document, this *Provincial Fish Strategy* identifies goals, objectives and tactics to guide MNRF's management, science and cooperative activities for managing Ontario's fisheries resources. MNRF's vision describes the optimal state of Ontario's fisheries resources, while the mission defines MNRF's role in achieving the *Strategy*'s goals and objectives (see text box, this page).

The *Strategy* is intended to be a flexible, evolving document that allows MNRF and its partners to address new management challenges and priorities as they emerge. It has two main purposes:

- To improve the conservation and management of fisheries and the ecosystems on which fish communities depend; and
- To promote, facilitate and encourage fishing as an activity that contributes to the nutritional needs, and the social, cultural and economic well-being of individuals and communities in Ontario.

This *Strategy* will help inform MNRF fisheries policy development, decision making and science priorities, and will provide input into other natural resources management policy and planning processes. It will assist MNRF in prioritizing its efforts and coordinating its activities as it addresses new and emerging issues that impact Ontario's fisheries resources.

Top photo: Walleye (*Sander vitreus*). M. Garvin

MNRF'S VISION is healthy ecosystems supporting native self-sustaining fish communities, and fisheries that provide long-term ecological, social, economic, cultural and health benefits for the people of Ontario.

MNRF'S MISSION is to provide leadership in the management of Ontario's fisheries, and the protection, restoration, and recovery of fish communities and their supporting ecosystems.

The scope of *Ontario's Provincial Fish Strategy* extends across management and conservation of all existing and potential freshwater fisheries of the Great Lakes, and the inland lakes, rivers and streams of Ontario. These fisheries vary in magnitude and complexity and include recreational, commercial, and First Nations and Métis fisheries. The *Strategy* is intended to be inclusive of all fisheries, whether based on wild or stocked fish, in urban areas or remote areas, large water bodies or small ponds and streams. It is guided by a number of ecological principles and principles of conduct, as described in the text box on the next page.

In addition to providing direction for MNRF, the *Strategy* also lays out objectives and tactics that allow MNRF to support and guide the work that other government agencies, First Nations and Métis communities, and non-government partners undertake to conserve and manage fish populations and promote fishing.

This *Strategy* is framed around three levels of guidance:

- Long-term, aspirational **Goals** that reflect ideal future conditions.
  - **Goal 1:** Healthy ecosystems that support self-sustaining native fish communities.
  - **Goal 2:** Sustainable fisheries that provide benefits for Ontarians.
  - **Goal 3:** An effective and efficient program for managing fisheries resources.
  - **Goal 4:** Fisheries policy development and management decisions that are informed by sound science and information.
  - **Goal 5:** Informed and engaged stakeholders, partners, First Nations and Métis communities and general public.
- Shorter-term, more specific **Objectives** that represent categories of activity; and
- Detailed and specific **Tactics** that MNR, either alone or in partnership with others, can undertake to contribute to achievement of Goals and Objectives

As will be apparent from this list, Goals 1 and 2 address conservation of biodiversity and sustainable fisheries, while Goals 3, 4, and 5 provide the administrative and policy framework within which fisheries and fish habitat are managed. Progress toward desired outcomes will be measured regularly and reported to the public through State of Resource Reporting.

The following sections describe each goal in more detail, and discuss associated objectives and tactics for each.

Principles

The following principles of ecology and conduct are values that will be used to guide fisheries management planning and decision making, and are considered key to achieving the desired future state of the fisheries resources in Ontario. They are derived from broader MNRF Strategic Direction.

ECOLOGICAL PRINCIPLES

Natural Capacity: There is a limit to the natural capacity of aquatic ecosystems and hence the benefits that can be derived from them. Self-sustaining populations can provide long-term benefits when harvested at levels below Maximum Sustainable Yield.

Naturally Reproducing Fish Communities: Self-sustaining fish communities based on native fish populations will be the priority for management. Non-indigenous fish species that have become naturalized are managed as part of the fish community, consistent with established fisheries management objectives.

Ecosystem Approach: Fisheries will be managed within the context of an ecosystem approach where all ecosystem components including humans and their interactions will be considered at appropriate scales. The application of the ecosystem approach includes the consideration of **cumulative effects**.

Protect: Maintaining the composition, structure and function of ecosystems, including fish habitat, is the first priority for management, as it is a lower-risk and more cost effective approach than recovering or rehabilitating ecosystems that have become degraded.

Restore, Recover, Rehabilitate: Where native fish species have declined or aquatic ecosystems have been degraded, stewardship activities such as restoration, recovery and rehabilitation will be undertaken.

Fish and Aquatic Ecosystems are Valued: Fisheries, fish communities, and their supporting ecosystems provide important ecological, social, cultural, and economic services that will be considered when making resource management decisions.

PRINCIPLES OF CONDUCT

Aboriginal and Treaty Rights: Aboriginal rights and interests in fisheries resources will be recognized and will help guide MNRF's plans and activities. MNRF is committed to meeting the province's constitutional and other obligations in respect of Aboriginal peoples, including the duty to consult.

Informed Transparent Decision Making: Resource management decisions will be made in the context of existing management objectives and policies, using the best available science and knowledge in an open, accountable way through a **structured decision making** process. The sharing of scientific, technical, cultural, and traditional knowledge will be fostered to support the management of fish, fisheries and their supporting ecosystems.

Collaboration: While MNRF has a clear mandate for the management of fisheries in Ontario, successful delivery of this mandate requires collaboration with other responsible management agencies, First Nations and Métis communities, and others who have a shared interest in the stewardship of natural resources.

GOAL 1

Rosyface Shiner (*Notropis rubellus*). A Dextrase

GOAL 1:
HEALTHY ECOSYSTEMS THAT SUPPORT SELF-SUSTAINING NATIVE FISH COMMUNITIES

Ontario's vast array of recreational, commercial and First Nations and Métis fisheries are dependent on healthy aquatic ecosystems, including high quality fish habitat. The focus of Goal 1 is to protect and rehabilitate or restore native fish communities and their supporting ecosystems and habitats, and to avoid introductions of new species. Some of Ontario's aquatic ecosystems, such as the Great Lakes, have been irreversibly altered. In many cases, species have been **introduced** and are now naturalized, providing significant economic, social, and in many cases ecological benefits. Like native species, naturalized species and their supporting ecosystems and habitats should be afforded protection and rehabilitated or restored consistent with established fisheries management objectives.

The health of ecosystems is usually assessed against three main attributes, all of which can be examined at various scales, from a site to a provincial scale:

- **Composition**, including the diversity and abundance of the species present;
- **Structure**, the physical arrangement of the ecosystem, including the types and pattern of habitats, and how they are connected; and
- **Functions**, the **processes** that drive change in the system, including photosynthesis, predation, decay and nutrient cycling, and soil formation, and natural disturbances such as wind and fire.

Goal 1 Objectives:

1.1 Protect and maintain aquatic **ecosystem diversity**, connectivity, structure, and function, including fish habitat.

1.2 Protect the composition of native fish communities.

1.3 Restore, recover or rehabilitate degraded fish populations and their supporting ecosystems, including fish habitat.

1.4 Prevent unauthorized introductions and slow the spread of invasive fish and other aquatic species, including pathogens.

1.5 Anticipate and mitigate or adapt to large scale environmental changes and minimize cumulative environmental effects.

LEADERSHIP AND SUPPORTIVE ROLES IN MANAGING ECOSYSTEMS, INCLUDING FISH HABITAT

In achieving Goal 1, MNRF works within the complex legislative and jurisdictional framework for fisheries described in Section 5, coordinating planning and activities across a variety of agencies and levels of government. Leadership and supportive roles in these relationships often depend on specific aspects of ecosystem protection and rehabilitation and the legislative authority, jurisdiction and mandate of each organization. MNRF is the agency charged with administration of the *Public Lands Act* and the *Lakes and Rivers Improvement Act*, and has a clear mandate to carry out those responsibilities. In other cases, MNRF supports actions taken by other agencies or levels of government. For example, municipalities have the primary responsibility for land use planning under Ontario's *Planning Act*. In urban areas, municipalities in partnership with Conservation Authorities play an important role in protecting aquatic ecosystems, including fish habitat. MNRF supports those efforts by providing formal guidance to municipalities on **natural heritage** management (e.g., MNRF's *Natural Heritage Reference Manual*).

Written agreements help to clarify roles and responsibilities where multiple agencies are involved. For example, the *Fish Habitat Referral Protocol for Ontario, 2009* outlines the permitting and approval roles of different agencies and describes how they collaborate in the review of projects in and around water. As the lead for fisheries management in the province, MNRF sets Fisheries Management Objectives (FMOs) and is the lead agency for setting Restricted Activity timing windows for work in and around water (to protect critical life stages of fishes). When other agencies are reviewing applications under their legislation (e.g., *Fisheries Act*) that may affect fish and fish habitat, MNRF may provide advice on FMOs during the referral process and identify any concerns with the project to the reviewing agency, as required.

Depending on their location, Ontario's aquatic ecosystems have varying **thermal regimes** and can support warm, cool or cold water fisheries that vary in their natural productivity and diversity across the landscape. Within each ecosystem, there are a variety of habitats on which fish populations depend. Habitats play a critical role in the survival of a species, by providing the specialized requirement for shelter, food and reproduction that a species needs to fulfill its complex life cycle.

Ecosystems are inherently dynamic, changing in response to shifts in the mixture and abundance of species and their physical surroundings. Ecosystems with more native biological diversity are more resilient – better able to withstand disturbance and return to a natural range of variation If disturbance exceeds an ecosystem's ability to respond, the ecosystem can shift into a new and potentially unstable condition. Protection and conservation of aquatic ecosystems, including fish habitat, is therefore critical for supporting self-sustaining fish populations and protecting Ontario's fisheries resources.

The five Objectives under Goal 1 are aimed at protecting and managing native fish populations and the diversity, connectivity, structure, and function of Ontario's aquatic ecosystems, and restoring or rehabilitating them where they are degraded. This includes avoiding or mitigating stressors, such as habitat alteration, invasive species, and pollution, which can have direct impacts (e.g., sedimentation of spawning beds, barriers to fish migration) or indirect impacts (e.g., removal of shoreline vegetation, leading to increased water temperature) on **ecosystem health**. It also means adapting to large scale stressors, and reducing the potential for the cumulative impacts of multiple stressors, which can be much greater than any single stressor operating alone.

W. Wegman

Objective 1.1: Protect and maintain aquatic ecosystem diversity, connectivity, structure, and function, including fish habitat

Ontario's fisheries depend on healthy aquatic ecosystems. Human activities such as urban development, shoreline or wetland alteration, dam construction, or resource extraction activities like mining or forestry can directly impact fish habitat and therefore the diversity, connectivity, structure and function of aquatic ecosystems. Fisheries can also impact aquatic ecosystems directly or indirectly by altering species composition, and thus the structure and function of the aquatic community. For example, selective removal of a particular top predator species or size of fish, or removal of non-target species (**bycatch**), can alter food web relationships and create conditions that allow the invasion of non-native species or disease pathogens. Understanding ecosystem structure and function therefore helps to develop appropriate strategies to avoid or mitigate impacts.

Connectivity is integral to the structure and function of aquatic ecosystems, and is a primary consideration in achieving healthy and sustainable fisheries. However, where landscapes are disturbed and aquatic systems stressed by invasive species and impaired water quality, restoration of connectivity may not be sufficient to achieve desirable ecological conditions. In some cases, it may be necessary to block connectivity to protect fisheries, for instance with the placement of Sea Lamprey barriers.

The tactics for Objective 1.1 focus on conserving the diversity, connectivity, structure and function of Ontario's aquatic ecosystems through landscape-level planning and related activities. They are intended to encourage consideration of fish community structure and fish habitat in fisheries management decisions, and in preventing and mitigating the impacts of land-based activities on aquatic ecosystems.

Tactics

a) Continue to implement existing, and where necessary develop new, legislation and policies that protect fish and fish habitat, and aquatic ecosystem structure and function.

b) Promote the consideration of aquatic ecosystem and fish habitat protection objectives in government programs, policies and decisions.

- Account for the potential ecosystem effects of fishing such as community imbalance when planning and implementing fisheries management actions.

H. Bickle

THE ROLE OF PARKS

Ontario's provincial parks and conservation reserves permanently protect ecosystems, biodiversity, and significant parts of Ontario's natural and cultural heritage while providing opportunities for ecologically sustainable outdoor recreation. The focus is on maintaining ecological integrity, so parks may need to use different approaches to managing fisheries and reducing environmental risks than might apply elsewhere. For example, some protected areas may have specialized fishing rules, regulations and/or fisheries management plans.

These natural areas provide a range of other benefits to Ontarians. Many are important locations for scientific research and play an important role in understanding change on the broader landscape. Some provincial parks and conservation reserves provide angling opportunities in remote wilderness-like settings, while others offer family fishing experiences including TackleShare and Learn to Fish programs.

- Continue, and look for new opportunities, to incorporate aquatic ecosystem protection objectives into planning for land use, forest management, other resource management activities, and watershed planning at appropriate scales.
- Support the review and assessment of proposed development projects that may pose risk to fish communities, habitats and ecosystems, for example as part of environmental assessment processes.

c) Protect Ontario's diversity of aquatic ecosystems within National Parks and Provincial Parks and Protected Areas, and through land securement and stewardship partnerships.

d) Develop an aquatic ecosystem classification system for Ontario, to provide a framework for conservation and management.

e) Continue to identify and protect aquatic natural heritage systems, features and values.

Objective 1.2: Protect the composition of native fish communities

Objective 1.2 is intended to protect the distribution, status, and **genetic diversity** of native fish species, populations and communities across the landscape. Ontario supports a wide variety of fish communities, reflecting the province's geology, climate, and post-glacial colonization. Some fish communities are very simple, as in some northern Ontario lakes; others are very complex, as in southern Ontario streams and the Great Lakes. **Species diversity** reflects a rich variety of structures, processes and functions within an ecosystem that contributes to **ecosystem resilience**. Genetic diversity within a population of organisms helps the population to adapt to changing environmental conditions and thus remain viable over time. In order to maintain ecosystem resilience, ecosystem components that have a disproportionate influence or importance (**keystone species**, **keystone ecosystems**, **or keystone processes**) should be retained on the landscape.

Stocking of artificially propagated fish and the transfer of wild fish have played an important role in fisheries management in Ontario. While sometimes necessary to achieve fisheries management goals, stocking carries ecological risks, including the potential for loss of genetic integrity in native fish stocks and changes to community structure, such as the predator-prey balance.

MNRF

Tactics under Objective 1.2 are geared to improving knowledge about native species, and implementing actions that protect native fish communities and gene pools.

Tactics

a) Improve knowledge of the distribution and status of native fish communities and their habitats across Ontario through inventory, monitoring, research and classification.

b) Where conservation concerns exist, proactively develop and implement species-specific policies and plans to protect and manage native fish species, through collaborative partnerships.

c) Develop and use fisheries management techniques that protect native species and gene pools, for example guidelines for brood stock or egg collection that protect genetic diversity.

Objective 1.3: Restore, recover or rehabilitate degraded fish populations and their supporting ecosystems, including fish habitat

Many aquatic ecosystems, especially in southern Ontario, are degraded and require rehabilitation or restoration. Developing and implementing rehabilitation plans is a challenging task, and requires that MNRF encourage and work with partners including government agencies, Conservation Authorities, industry, academics, First Nations and Métis communities, and stakeholders. Recovery and rehabilitation objectives are often established through planning, such as species at risk recovery and management planning, and watershed and watershed-based fisheries management planning. Great Lakes Areas of Concern may also have their own specific rehabilitation objectives. In some cases, recovery and rehabilitation objectives and actions must be balanced across multiple species, although efforts directed at a single species often have benefits for others.

Tactics to achieve Objective 1.3 emphasize continued restoration or rehabilitation of native fish communities, particularly of species at risk and the ecosystems that support them.

Tactics

a) Develop and implement rehabilitation or restoration plans for degraded native fish populations and fish habitats, through collaborative partnerships.

b) Operate a fish culture program that supports the rehabilitation of native fish populations.

c) Develop and implement recovery and management plans for aquatic species at risk and their habitat.

d) Review and update provincial fisheries policies and management practices that may affect the recovery of species at risk.

LAKE ONTARIO ATLANTIC SALMON RESTORATION: STAKEHOLDER, INDUSTRY, AND GOVERNMENT PARTNERSHIP

Native to Lake Ontario, Atlantic Salmon were common until the late 19th century and supported significant food fisheries. Unfortunately, that population is now extinct as a result of the cumulative effects of the environmental degradation of streams, ecosystem changes in the lake, and over-fishing. In 2006 private, public and non-government organizations united to achieve a common goal to restore Atlantic Salmon in Lake Ontario, based on four components: fish production and stocking; research and monitoring; water quality and habitat enhancement; and education and outreach.

The Ontario Federation of Anglers and Hunters (OFAH) and MNRF are jointly leading the restoration efforts, and are working with more than 40 partners and sponsors, including Non-Governmental Organizations (NGOs), conservation organizations, local clubs, private land owners and the public. The federal government, Conservation Authorities, private sector companies and municipalities are contributing substantial funding over multiple years and in-kind support to the Atlantic Salmon restoration efforts.
The program has lead to the completion of more than 150 **habitat restoration** projects aimed at improving stream habitat. Dozens of schools have received classroom hatcheries, one of the key educational components of the program.

Early results in this multi-year effort have been encouraging, with young fish surviving well in the streams and adult fish returning to the target streams beginning in 2008. Although not yet a self-sustaining population, some successful reproduction has been documented and the future for Atlantic Salmon in Lake Ontario is looking brighter.

Atlantic Salmon (*Salmo salar*). MNRF

Rusty Crayfish (*Orconectes rusticus*). MNRF

Tactics

a) Implement actions related to the prevention, early detection, rapid response and effective management of aquatic invasive species (AIS), including supporting the regulation of species under the proposed *Invasive Species Act* or other regulatory tools as appropriate.

b) Work with other agencies, academia, stakeholders, First Nations and Métis communities, and the private sector on fish disease surveillance, control, prevention and research, and define roles and responsibilities for managing fish health.

c) Develop and implement best management practices to mitigate the risk of spreading alien species and pathogens through fisheries management actions.

Objective 1.4: Prevent unauthorized introductions and slow the spread of invasive fish and other aquatic species, including pathogens

The intent of Objective 1.4 is to curb the introduction and spread of aquatic **alien species**, particularly those that are invasive. Fish community changes can be caused by intentional or unintentional introductions of species through activities such as unauthorized stocking, release of live bait and movement of boats and gear between water bodies.

The Ontario government has been involved in aquatic invasive species prevention and management activities since the early 1990s. Although there are many examples where these efforts have been effective, species continue to arrive and spread in Ontario. New approaches and tactics are required to address the current and future threats. In 2012, the Ontario government released the *Ontario Invasive Species Strategic Plan*, highlighting work that has already been undertaken and identifying gaps in current programs and policies. Since the release of the plan, MNRF has examined how Ontario's existing legislation and policy framework addresses invasive species. This analysis clearly identified the need for a stronger legislative framework. In response, the government has drafted an *Invasive Species Act*, the first of its kind in Canada. The proposed Act will provide a stronger legislative framework to prevent, detect, rapidly respond, and manage invasive species that impact Ontario's aquatic ecosystems.

Tactics under Objective 1.4 focus on prevention, early detection, rapid response, and management of aquatic invasive species as prescribed in the Ontario Invasive Species Strategic Plan. They also encourage better understanding of fish health, as a basis for managing the spread of invasive pathogens and other causes of disease outbreaks.

Silver Carp (*Hypophthalmichthys molitrix*). T. Lawrence – GLFC

Objective 1.5: Anticipate and mitigate or adapt to large scale environmental changes and minimize cumulative environmental effects

Some drivers, such as climate change, operate at very large scales but may have important direct local effects on fish communities and fisheries, or indirectly through effects on their supporting ecosystems, including fish habitat. Ecosystems have a limited adaptive capacity and therefore are vulnerable to the effects of climate change. Over the next several decades, Ontario's current climate will shift northward at a rate that may exceed the ability of some individual fish species to adjust. Climate change impacts on aquatic species will be ongoing, cumulative, and interactive. As discussed in Section 6, vulnerability assessment evaluates the ecological or biological mechanisms that prevent species, habitats and/or processes from coping with stress from a warming climate, and informs the development of management options for adaptation.

Fisheries management planning should incorporate assessment of the cumulative effects of multiple stressors, including climate change and the effects of past, present, and foreseeable future actions, on aquatic ecosystems and fish communities. The tools and approaches for cumulative effects assessment are continually evolving, so cumulative effects assessments should be revisited periodically as part of an adaptive management approach.

The intent of Objective 1.5 is to recognize the importance of broad-scale drivers like climate change and invasive species, and the cumulative effects of multiple stressors across the landscape. Tactics under Objective 1.5 emphasize the need for adaptation strategies for managing aquatic ecosystems and fisheries, and development and application of tools for cumulative effects assessment.

Tactics

a) Develop and implement fisheries management adaptation guidelines (e.g., to assist the migration of fish species) to address potential positive and negative impacts related to climate change.

b) Conduct assessments of the vulnerability of fish species and fish community structure to climate change.

c) Work with partner agencies, academia, stakeholders, and First Nations and Métis communities to develop and implement integrated watershed and resource management plans that include aquatic ecosystem and sustainable fisheries objectives, and thus provide a framework for cumulative effects assessment.

d) Contribute to initiatives that advance understanding and the development of decision making tools to inform the evaluation and mitigation of cumulative effects.

M. Garvin

GOAL 2

GOAL 2:
SUSTAINABLE FISHERIES THAT PROVIDE BENEFITS FOR ONTARIANS

A well-managed fishery, supported by high quality fish habitat and a healthy aquatic ecosystem, is a renewable resource that replenishes itself annually and provides outdoor activity, wholesome food, employment and income, and social and cultural benefits for present and future generations. The economic benefits of Ontario's recreational, commercial, and First Nations and Métis fisheries are valued in the billions of dollars, and are of particular importance to the local economies of northern Ontario. For First Nations and Métis communities, fishing for food, social and ceremonial purposes is a part of their traditional way of life and often provide an essential component of their nutritional intake. Many First Nations and Métis peoples are also involved in commercial fishing, and in an array of other activities related to fisheries. An example is the partnership between MNRF and the Union of Ontario Indians to establish the Anishnabek/ Ontario Fisheries Resource Centre, which focusses on fisheries assessment, conservation, and management (see text box, page 45).

Goal 2 Objectives:

2.1 Harvest fish within safe biological limits.

2.2 Allocate fish resources considering the needs and interests of all users.

2.3 Increase economic, social and cultural benefits derived from fish resources.

2.4 Promote the development and use of responsible fishing practices.

2.5 Reduce the risks to human health associated with contaminants and pathogens.

The social and cultural benefits of recreational fishing are more difficult to define. In addition to the opportunity to catch fresh, healthy food, fishing provides a variety of nonmaterial benefits such as spiritual enrichment, relaxation, anxiety and stress relief, aesthetic experience, exercise, healthy lifestyles, and activities that build social cohesion and connections. Fishing is an activity that initiates, builds and strengthens intergenerational relationships, where values and skills are passed on and generations share healthy outdoor activity together.

Top photo: Lake Trout (*Salvelinus namaycush*). S. Gibson

The five Objectives under Goal 2 are aimed at using fisheries resources sustainably; allocating fish resources fairly within the current legal context; marketing and promoting fishing where sustainable opportunities exist; encouraging best management practices by fisheries users; and ensuring that users are aware of any contaminant concerns.

Objective 2.1: Harvest fish within safe biological limits

Overharvesting has long been recognized as a key stressor on fisheries resources, and often works in conjunction with other stressors such as invasive species, habitat loss, and aquatic ecosystem degradation in causing population declines. Establishing fisheries objectives that recognize safe biological limits (benchmarks for sustainability, as discussed in Section 6: Adaptive Management Approach) is essential in maintaining sustainable fisheries. Fisheries management planning, supported by advisory groups, is the principal mechanism for this. As part of adaptive management, monitoring and assessment are necessary to support the periodic review and adjustment of management strategies. (Tactics under Objective 4.1 also speak to this point from the perspective of science and monitoring.)

Tactics to achieve Objective 2.1 emphasize the need for a structured management approach that includes setting measurable fisheries management objectives at appropriate scales, with input from partner agencies, First Nations and Métis communities, stakeholders, academia and others with a shared interest.

Tactics

a) Develop and implement fisheries management plans with measurable objectives for Fisheries Management Zones and for intensively managed water bodies such as Provincially Significant Inland Fisheries.

b) Monitor and periodically review indicator data against benchmarks for sustainability, to evaluate and report on progress towards achieving fisheries management objectives.

c) Continue the development of bi-national fish community goals and objectives and implement management programs for each of the Great Lakes and other border waters.

d) Review, amend and where necessary develop and implement new policies to guide the planning and management of recreational, commercial and First Nations and Métis fisheries.

MNRF – COA Program

Objective 2.2: Allocate fish resources considering the needs and interests of all users

Allocation is a process that divides the resource or access to it amongst resource users, determining who, how and when users will harvest the resource. Allocation decisions are made in consultation with communities and stakeholders, and consider the needs of all users. Consistent with the *Constitution Act* and existing case law, fisheries resources are allocated as follows:

- Conservation of the resource is the first priority.
- After conservation, existing Aboriginal and Treaty rights take priority before allocation and management of the resources for recreational, commercial food and bait fisheries.

Fisheries resources are allocated in different ways, depending on the type of fishery. For all but a few of Ontario's recreational fisheries, the allocation of fisheries occurs implicitly, through licensing. An individual is issued a recreational fishing licence that allows them the privilege to fish anywhere in Ontario, subject to localized harvesting restrictions that specify seasons, daily catch and size restrictions. These restrictions affect the harvest of fish by individuals, but do not limit the overall harvest by all anglers. This results in open-access fisheries for recreationally harvested species in Ontario.

By contrast, the licenced commercial food fisheries in Ontario are managed under a limited access model. Commercial food fishing licences have specific quotas that limit the total weight and species of fish that can be harvested. The sum of all quotas constitutes a formal allocation of fish to this user group. The number of commercial licences issued on a water body is controlled and is based on the level of harvest that a fish population can sustain over the long term, and the current level of harvest by other user groups. For commercial bait fisheries, the current management approach places no limit on the number or amount of legal bait fishes that may be harvested. Rather, bait harvesters are allocated a Bait Harvest Area (BHA) that grants them unlimited access to the bait resources within a specified area.

Tactics to achieve Objective 2.2 focus on developing policies and processes for allocating fisheries.

Tactics

a) Develop an allocation policy in consultation with recreational and commercial fishers, and Aboriginal communities to guide fisheries resource allocation decisions.

b) Involve Aboriginal communities in the management of fisheries to further the resolution of issues related to fisheries harvesting rights.

c) Develop an understanding of historical and current harvest, and the future needs of First Nations and Métis communities, to adequately inform fisheries management decisions.

d) Review allocation processes related to commercial bait fisheries to ensure sustainable harvests.

Smallmouth Bass (*Micropterus dolomieu*). R. MacGregor and N. Butala

Objective 2.3: Increase economic, social and cultural benefits derived from fish resources

More than 1.2 million anglers participate in Ontario's recreational fisheries, contributing over $2.2 billion each year to the provincial economy. Commercial food and bait fisheries also have a significant impact on the provincial economy, contributing over $250 million annually. Within the bounds of sustainability, there is considerable potential to increase these benefits, by:

- increasing the number and types of fisheries;
- encouraging the selective harvest of fish as a healthy food source, within the bounds of sustainability; and
- marketing high quality opportunities for fishing-related tourism.

Participation in fishing depends on many factors, and is not just a function of the quality and quantity of fish available. It also depends on competing water uses, the availability of alternative recreation, public access to water bodies, restrictions on use or harvest, the need to obtain equipment and skills to use them effectively, and individual perceptions or values related to ethical use of fish. Increasing participation in fisheries therefore demands a combination of tactics geared to increasing fishing opportunities, improving access, and expanding the range of species that angler's target.

Recreational fisheries close to or within towns and cities provide opportunities for healthy, low-cost outdoor activity, especially for children and youth. In many areas especially northern Ontario, these fisheries support tourism, which can provide local jobs and economic benefits to the community. Publicly owned land adjacent to water bodies provides opportunities for people to fish, but access to suitable fishing sites, especially in urban areas, is often limited. Municipalities can work with partners to promote and encourage fishing in their jurisdictions.

Stocking is an important management tool to create fishing opportunities where they do not exist, or where native fish populations cannot support sustainable fishing pressure. For example, Put-Grow-Take (P-G-T) fisheries create new fishing opportunities, especially near urban areas, while alleviating fishing pressure on more sensitive species and locations. In P-G-T operations, small fish are stocked with the sole purpose of growing them for later catch and consumption.

M. Garvin

Competitive fishing involves organized events in which anglers fish for inducements (i.e., prizes, awards, recognition), in addition to the catch or the satisfaction of catching fish. Competitive fishing events include derbies, tournaments, and contests. There are more than 1,000 competitive fishing events held in Ontario annually. Although only 5% of recreational anglers currently participate, the interest in competitive fishing has increased over the past 10-15 years.

Finally, the majority of benefits derived from Ontario's fisheries come from catching and harvesting a limited number of species. Increased benefits can be derived from alternate species, in particular those species where fishing mortality is absent or is well within safe levels. These efforts can complement local actions to reduce harvest of a species by redirecting effort to a new species within lakes and/or to new water bodies. Diversifying the fisheries through which benefits are derived should increase the resiliency of Ontario's commercial, recreational and First Nations and Métis fisheries.

Tactics under Objective 2.3 promote opportunities to maintain and increase sustainable benefits derived from fish resources where consistent with provincial, regional and local fisheries management objectives.

Tactics

a) Develop and implement marketing techniques that focus on angler recruitment and retention, to increase participation in recreational fishing.

b) Support the development and implementation of urban fishing strategies in partnership with municipalities, stakeholders and industry to promote and improve recreational fishing opportunities, such as identifying, enhancing and increasing access to fishing spaces.

c) Collaborate with partners to promote sustainable high quality fishing opportunities to attract anglers to Ontario's fishing destinations.

d) Plan for, and undertake, stocking to effectively support fisheries management objectives.

e) Operate a fish culture program that supports the provision of hatchery-dependent angling opportunities where consistent with fisheries management objectives.

f) Encourage fishing for non-traditional species to increase fishing opportunities.

g) Continue to work with the commercial fishing industry and other interested parties to diversify fisheries and help facilitate access to traditional and non-traditional markets.

MNRF – Learn To Fish Program

Objective 2.4: Promote the development and use of responsible fishing practices

Fishing practices vary depending on the fishery. In commercial fisheries, the mortality of non-target species (bycatch) is a primary consideration. Bycatch can be reduced through the operator's fishing choices and activities, including equipment, but also through licence conditions related to seasons, gear type, and location.

In recreational fisheries, the release of angler-caught fish is encouraged as a voluntary activity within a selective harvest framework, and is often regulated by season, catch and size restrictions. There is considerable evidence that caught-and-released fish, when handled appropriately, survive with minimal sub-lethal effects. MNRF has published tips to promote the effectiveness of catch and release practices, and also provides guidance for competitive fishing events to minimize mortality. Fish welfare concerns are nevertheless likely to continue into the future. MNRF has an important role to play in outreach and education for commercial and recreational fishers to encourage responsible fishing practices and maximize the benefits of selective harvest practices and angling regulations.

Tactics to achieve Objective 2.4 focus on the development and use of best management practices to reduce fishing-induced stress and injury to fish and to reduce the impacts of fishing on fish populations and aquatic ecosystems.

Tactics

a) Develop, implement, and promote guidelines that support and encourage responsible fishing practices and fisheries resource use, in collaboration with stakeholders, industry, First Nations and Métis communities, academia, and other agencies (e.g., policies related to commercial bycatch and competitive fishing events).

b) Continue to develop and use animal care and invasive species prevention protocols when implementing MNRF's research, monitoring and assessment programs, and promote the use of these protocols when issuing licences under the *Fish and Wildlife Conservation Act*.

J. Garvin

Objective 2.5: Reduce the risks to human health associated with contaminants and pathogens

Contaminants in fish tissue can come from local sources or can be airborne from distant sources. MNRF and MOECC collect fish that are analyzed for a variety of substances. The results provide the public with information on the size and quantities of sport fish that are safe for consumption based on Health Canada guidelines. MNRF has the authority to close or restrict fisheries to reduce exposure to the risk presented by contaminated fish, so fish consumption advisories may also inform conditions on commercial licences. Standards for the safe handling and processing of fish at licenced facilities help ensure that wholesome fish are sold for human consumption.

Tactics under Objective 2.5 are intended to reduce potential risks to human health related to fish consumption from fish harvested by First Nations and Métis, recreational and commercial fisheries.

Tactics

a) Collaborate with agencies such as MOECC, DFO, Ontario Ministry of Agriculture, Food and Rural Affairs and the Canadian Food Inspection Agency, that manage fish contaminants and pathogens, to reduce the potential risks to human health related to consumption of wild caught fish:

- develop an appropriate food fish safety legislation and policy framework.
- develop a better understanding of fish contaminant issues and current roles and responsibilities.
- monitor contaminant levels in fish, and communicate associated risks with human consumption, to the public, stakeholders and First Nations and Métis communities.

M. Garvin

GOAL 3

GOAL 3:
AN EFFECTIVE AND EFFICIENT FISH MANAGEMENT PROGRAM

Ontario's fisheries management program is complex, crossing multi-divisional boundaries within MNRF, and linking closely to the mandates of other provincial, federal, inter-provincial, municipal and international agencies. As discussed in Section 5, DFO and MNRF have statutory authority for the protection and management of Ontario's fisheries resources. This mandate is delivered through a policy and institutional framework that involves legislation, regulations, policies, planning, program development and delivery, and collaboration with other organizations. Risk-informed fisheries management planning is used to set priorities and help ensure that limited resources are directed where most needed.

Good fisheries governance also means encouraging the consideration of ecosystem management and fisheries management objectives in the work of other agencies at all levels of government. For example, efficient achievement of fisheries management goals requires integration with other agency approvals, such as approvals under *the Planning Act*, the *Fisheries Act*, or the *Ontario Environmental Assessment Act*. (Objective 5.2 speaks to this point in more detail).

Partners and stakeholders influence the content and direction of MNRF policies by participating in policy development, implementation, and periodic review. Effective consultation and engagement with key partner agencies, First Nations and Métis communities, recreational and commercial fishers and other stakeholders is especially important in this process.

Goal 3 Objectives:

3.1 Sound governance to successfully achieve fish management objectives and continually improve the efficiency and effectiveness of fisheries management.

3.2 Effective regulations, policies and practices to guide present and future actions and decisions.

3.3 Maintain a competent, well-trained and educated workforce.

3.4 Provide services that are accessible, responsive to needs, consistent and fair.

3.5 Achieve a high level of compliance with legislation, regulations and policy.

Objective 3.1: Sound governance to successfully achieve fish management objectives and continually improve the efficiency and effectiveness of fisheries management

Good governance is critical in delivering an effective and efficient program that achieves stated objectives. It defines the set of responsibilities and practices, policies and procedures exercised by MNRF and other agencies to contribute to overall performance and the delivery of services and programs. It also helps to ensure that legal and regulatory requirements and expectations of integrity, accountability and openness are met. Effective governance should be supported by sustainable and appropriate funding mechanisms for administration and program delivery.

Tactics under Objective 3.1 focus on maintaining and improving effective governance of Ontario's fisheries through regular review of structures and practices; identification of management priorities; maintaining revenue; measuring performance; and applying new technology.

Tactics

a) Identify program priorities, align resources with the highest priorities and coordinate implementation across governments and with stakeholders.

b) Develop implementation plan(s) to deliver this *Strategy*; establish and monitor performance measures; and, evaluate and report whether the goals and objectives of this *Strategy* are being met.

c) Regularly review, adapt and improve fisheries management governance structures and business practices.

d) Identify and eliminate unnecessary duplication in approval processes across multiple levels of government by modernizing and streamlining existing procedures and processes.

e) Continue to manage the fish and wildlife Special Purpose Account (SPA) with transparency, and in a way that supports effective use of revenue and the long-term sustainability of the account.

f) Continue efforts to make management of fisheries resources more effective and efficient through the use and application of new technology.

Objective 3.2: Effective regulations, policies and practices to guide present and future actions and decisions

Fisheries management often involves the implementation of laws and regulations. The federal *Fisheries Act*, the Ontario Fishery Regulations, and the provincial *Fish and Wildlife Conservation Act* regulate activities related to the use of recreational and commercial fisheries, and include provisions for the protection of fish habitat. These complex jurisdictional arrangements make it important to clarify responsibilities for certain activities, such as fish habitat protection and management. Written agreements, working groups, and similar mechanisms under strategic partnerships (see Objective 5.2) can help to clarify roles and responsibilities. For example, DFO reviews development proposals through a referral system, in which proponents may voluntarily submit information about their proposed projects to determine if they comply with the habitat protection provisions of the *Fisheries Act*. In Ontario, DFO works with MNRF and other agencies to develop responses to these referrals.

Fisheries policies interpret and support legislation and other strategic direction for the achievement of specific fisheries management goals and objectives. For example, the Ontario Fishery Regulations (2007) under the federal *Fisheries Act* define open seasons and limits for various Ontario species as well as acceptable methods and equipment for use in commercial and sport fishing within the province.

As a general principle, legislation and policies should be clear, uncomplicated, and readily available. They should also be reviewed periodically, as part of an effective policy development cycle, to ensure that they continue to be current and appropriate.

Tactics under Objective 3.2 are intended to strengthen the policy framework for managing Ontario's fisheries resources.

Tactics

a) Develop and implement an effective, overarching fisheries management policy framework:

- Conduct a gap analysis and identify the need for new or updated policies or legislation.
- Review, amend and where necessary develop new fisheries management legislation, strategic and operational policies and procedures, and implementation guidelines to ensure they reflect best practices, afford appropriate health and safety protections, and are consistent with other applicable legislation.
- Monitor and evaluate new and existing policies to determine the level of implementation and assess effectiveness.

b) Review and update recreational fisheries regulations, as required, to support fisheries management objectives.

c) Review options to improve efficiencies related to the production, dissemination and communication of recreational fishing regulations

Objective 3.3: Maintain a competent, well-trained and educated workforce

MNRF has a diverse workforce able to carry out the wide range of services required to manage fish, fisheries and aquatic ecosystems. Tactics to achieve Objective 3.3 focus on continuous training, mentorship, and development of resource management staff, to ensure continued MNRF competence in a field that is making constant advances in collective knowledge and improved practices.

Tactics

a) Enhance internal communication about policies, programs and activities for managing Ontario's fisheries resources using a variety of media and approaches to encourage communication across organizational boundaries.

b) Identify, support and deliver priority training and development needs, including mentorship, related to fisheries management and conservation of aquatic ecosystems.

c) Provide opportunities for training of MNRF staff in First Nations and Métis governance, rights, culture, and traditional way of life, as they relate to fisheries and their management.

Objective 3.4: Provide services that are accessible, responsive to needs, consistent and fair

MNRF provides services to the public through a variety of mechanisms. MNRF staff have expertise about fisheries resources and their management and readily share their knowledge with stakeholders and the public through a variety of print, electronic and in-person mechanisms. Many of the services provided by MNRF require individual interactions, and an emphasis on quality service will continue. Some services can be provided effectively through a modernized approach employing new technology. For example, Outdoors Cards and recreational fishing licence sales are available online, as well as through Service Ontario offices, and through external licence issuers. Ice hut registration is also available online. Other licences and authorizations such as licences to transport or possess live fish, licences to stock fish, commercial bait fish licences, and licences to collect fish are available through MNRF offices.

Tactics under Objective 3.4 represent a commitment to continued improvement in service delivery to the public.

Tactics

a) Provide internal and external clients with service excellence by consistently applying the MNRF service charter and standards, and the OPS common service standards.

b) Improve customer service delivery by modernizing, streamlining, and, where appropriate, automating existing MNRF procedures and processes for managing licencing.

Objective 3.5: Achieve a high level of compliance with legislation, regulations and policy

Enforcement of regulations is just one component of MNRF's compliance continuum, which also includes outreach and education, training, audits, inspections, and prosecutions. MNRF encourages compliance by actively involving stakeholders in the development of regulations through advisory committees and public consultation. Provincial, regional and local enforcement priorities are developed in conjunction with fisheries staff, and reviewed and amended annually. This helps to ensure that compliance is aligned with fisheries program priorities.

Tactics under Objective 3.5 emphasize promotion of compliance and education about regulations, monitoring compliance, enforcement, and prosecution where necessary.

Tactics

a) Work collaboratively within MNRF to align enforcement and fisheries program priorities using a risk-informed approach, and target enforcement efforts in high-risk areas.

b) Promote compliance by ensuring legislation and regulations are streamlined, accessible, easy to follow, and enforceable.

c) Continue to actively involve resource users and the public in regulation development and compliance activities.

d) Monitor and report on compliance to determine whether rules and regulations are being met and how compliance could be improved.

GOAL 4

MNRF

GOAL 4:

FISHERIES POLICY DEVELOPMENT AND MANAGEMENT DECISIONS THAT ARE INFORMED BY SOUND SCIENCE AND INFORMATION

Science is the generation and use of data, information, and knowledge from a variety of monitoring and inventory activities, data analysis and research. The Ontario government relies on science to inform and support fisheries program activities, including the development of legislation and policy, decisions about resource use, and implementation of conservation actions. Data, information, and knowledge that support decision making come from a variety of sources. MNRF is part of a broader knowledge community, in which many science activities and needs are met through effective partnerships with university researchers, other government agencies, stakeholder groups and First Nations and Métis communities.

Before fisheries resources can be effectively managed and conserved, the current status of the resources must be known. Data collection through routine inventory and monitoring at a variety of temporal and spatial scales informs understanding of the state of the resources. Fisheries managers require good, up-to-date data to assess risk, and to effectively plan and implement actions such as fish stocking and harvesting regulations. Effective monitoring is the backbone of an adaptive management system, and supports periodic review and adjustment of management strategies to better align outcomes with benchmarks of sustainability. It also provides a foundation for the assessment of cumulative impacts. Where monitoring data are scarce or out of date, the Precautionary Principle should be used in fisheries management and allocation decisions.

Goal 4 Objectives:

4.1 Monitor at the appropriate spatial and temporal scale.

4.2 Develop and use fisheries and aquatic sciences and social science.

4.3 A coordinated and standardized approach to information management and sharing of knowledge.

ANISHINABEK/ONTARIO FISHERIES RESOURCE CENTRE: SHARING SCIENCE AND KNOWLEDGE

The Anishinabek/Ontario Fisheries Resource Centre (A/OFRC) was established in 1995, to serve as an independent source of information on fisheries assessment, conservation and management, promoting the value of both western science and traditional ecological knowledge. The A/OFRC is a not for profit corporation reporting to a Board of Directors approved by the Grand Chief of the Anishinabek Nation and the Ontario Minister of Natural Resources and Forestry. MNRF is a member of the board. The Centre reports on stock status, evaluates stresses on fish populations and habitats, promotes the use of state of the art science and technology, and provides a forum for information sharing and participation with stakeholders. The Centre also plays an important role in offering management recommendations to promote sustainable fisheries.

Knowledge to improve understanding of fish communities, fisheries and how they function comes mainly from research. This new knowledge is used to predict cause and effect relationships, such as how a fish species or community will respond to natural or human pressures. It also improves understanding of how human preferences and behaviours can influence fisheries management outcomes. New knowledge helps to:

- predict and evaluate the effectiveness of legislation, policies and management decisions;
- support the development of management tools such as models, indicators, benchmarks, and diagnostic and decision support tools; and
- support the development of new technologies for fisheries monitoring and management.

Through their connections with the land and water, First Nations and Métis peoples have knowledge that can help to guide fisheries planning and management. Many have years of experience observing and interacting with the ecosystem, and have knowledge about aquatic ecosystems passed on to them from previous generations. This knowledge can be integrated with western science to better inform decision making, and is even more important where there are data and information gaps in areas such as the Far North. Long-term observational knowledge, and an understanding of patterns over time, can alert fisheries managers to species or ecosystem changes where monitoring data are limited. Opportunities to work with First Nations and Métis communities also exist in the collection of scientific data. For example, the Anishnabek/ Ontario Fisheries Resource Centre serves as an independent source of information that promotes the value of both western science and ATK (see text box, page 45); and the Matawa Tribal Council has a program to train community members in scientific data collection.

Other forms of traditional knowledge, handed down through generations of living and working within a family, community or culture, can also provide valuable understanding and contributions to fisheries management. For example, commercial fishers can contribute significant traditional ecological knowledge in the form of observations and comments on fish behaviour, timing of spawning, abundance, ecosystem relationships and fishing methods, based on their historical and cultural knowledge of the species and of the areas harvested.

Walleye (*Sander vitreus*). MNRF

It is important that scientific data, information and knowledge are regularly shared and readily available through expert advice, knowledge transfer, and training. In addition to improving the quality of management decisions, effective sharing of data, information and knowledge helps to increase understanding and reduce the potential for conflict.

INLAND LAKES BROAD-SCALE MONITORING PROGRAM: EVALUATING ACHIEVEMENT OF MANAGEMENT GOALS AND OBJECTIVES

In 2008, in support of the Ecological Framework for Fisheries Management, MNRF initiated the inland lakes Broad-scale Monitoring Program, a long-term, landscape-scale effort to monitor the health of Ontario's lakes and their fisheries. The Broad-scale Monitoring Program samples representative lakes across the province every 5 years, using standardized data collection methods. A wide range of variables are monitored: fish are netted to determine abundance, sex, length and weight, and to test for contaminants; water quality is analyzed; invasive species are recorded; and fishing effort is estimated. Broad-scale monitoring of inland lakes provides information to understand the status and trends of aquatic ecosystems, fisheries and biodiversity through time and over broad areas of the province. This information is valuable in determining whether the province's fish management goals and objectives are being achieved, or if management strategies need to be adjusted.

Objective 4.1: Monitor at the appropriate spatial and temporal scale

Several longstanding monitoring programs support MNRF's fisheries planning and management. MNRF conducts long-term broad-scale fisheries monitoring on inland lakes (see text box, page 46). Long-term intensive fisheries monitoring also occurs on the Great Lakes and selected provincially significant inland water bodies. Every five years, DFO's Survey of Recreational Fishing in Canada collects data on provincial fishing effort and harvest, as well as social and economic information related to recreational fisheries in Ontario. These programs generate data to assess fisheries status and trends and determine if management actions need adjustment. They also build understanding to inform current policy development and implementation decisions, and help MNRF anticipate future needs.

A small number of targeted monitoring programs are nested within this broader-scale framework. Targeted monitoring may be required when there is a need to track the response of a particular feature or species, such as a species at risk. Targeted monitoring should only be undertaken within an adaptive management context, and only when dictated by risk. Such monitoring must have a clear rationale and focussed, measurable objectives, and must be carried out using science-based standard protocols.

Monitoring programs benefit significantly from strategic partnerships with Conservation Authorities, DFO, Aboriginal communities, academia and neighbouring provinces and states. For example, Conservation Authorities monitor their watersheds using standard science-based methods such as the Ontario Stream Assessment Protocol. Data are collected on fish species present, species at risk, and invasive species, in addition to more routine fisheries and habitat monitoring activities. These programs help to improve understanding of the state of the watershed's aquatic ecosystems and the pressures affecting them. As another example, management of Great Lakes fisheries depends on monitoring partnerships with bordering U.S. State agencies. There may also be opportunities to expand the engagement of First Nations and Métis communities in monitoring, for example by developing mechanisms to share traditional knowledge and/or through the formation of monitoring partnerships.

Timely reporting of monitoring results is important for transparency and accountability, and for effective adaptive management. It also provides important information for the public, for example with respect to fish consumption guidance, and forms the basis of State of the Resources Reporting (see Objective 5.4).

Tactics under Objective 4.1 therefore encourage robust monitoring at appropriate scales, using standardized approaches, to support fisheries planning and management, and associated policy development.

Tactics

a) Develop an overarching provincial framework for monitoring fisheries and aquatic resources to inform and evaluate fisheries management plans and actions:

- Continue to monitor and report on the status of inland lake fisheries resources on a broad scale, and individual Great Lakes and Provincially Significant Inland Fisheries more intensively.
- Develop and implement a provincial monitoring and reporting program for understanding and communicating the status of fisheries resources in inland rivers and streams.
- Use site-specific targeted inventory and monitoring judiciously, where dictated by risk to the resource.
- Work with strategic partners to conduct social and economic surveys, both on a provincial level and more locally, to understand societal values, attitudes and opinions, and to assess the benefits derived from fish and fishing.
- Identify knowledge and information gaps and work toward development of monitoring strategies to address them.

b) Continue to develop strategic partnerships with Conservation Authorities and other government agencies, First Nations and Métis communities, organizations, industry and other stakeholders to monitor and report on Ontario's fisheries resources using common data collection methods and data standards.

Objective 4.2: Develop and use fisheries and aquatic sciences and social science

Research and data analysis support policy development and aid in assessing the effectiveness of management decisions related to allocation, licencing, rehabilitation and mitigation techniques. For that reason, it is important to engage the users of science in the development of policy and management priorities. Aquatic and social sciences can support fisheries management by helping to understand and predict:

- the functioning of and relationships among landscape processes, ecosystems, and food webs;
- the genetics, life history and habitat requirements of individual species;
- cause and effect relationships between pressures on fisheries resources and responses in fish communities;
- the social, cultural and economic benefits provided by fisheries; and
- human motivations and the implications of preferences and behaviours for management outcomes.

Science can also help to inform the development and continual improvement of new technologies, survey protocols and diagnostic tools for assessment of Ontario's fisheries resources.

Tactics under Objective 4.2 focus on the types of science activities needed to inform policy development and support risk-informed resource management decisions such as species priorities.

Tactics

a) Further develop indicators, reference points and diagnostic tools to assess the status of fisheries and to understand the pressures acting on them.

b) Further develop natural and social science-based models and decision analysis support tools to evaluate management options and assist in determining sustainable harvest rates for harvested fish species.

c) Continue to develop and use standard survey methods and indicators to monitor the status of priority species and stocks, biodiversity, fish habitat and supporting ecosystems.

d) In collaboration with the broader scientific community and other partners, identify knowledge gaps and conduct research on:

   - aquatic ecosystem composition, structure, and function and their responses to broad-scale stresses such as aquatic invasive species and climate change.
   - life history, habitat requirements, habitat supply and stock-recruitment for priority species.
   - science-based tools for the assessment of cumulative effects on fisheries at a variety of scales
   - other new science-based tools to fill knowledge gaps, such as methods of classifying aquatic ecosystems.

e) Continue to seek advice from the users of data, knowledge and information in the establishment of science priorities that support policy and management needs.

Objective 4.3: A coordinated and standardized approach to information management and sharing of knowledge.

The term "information management" refers to a suite of activities for managing information throughout its lifecycle, including planning, collection, use, maintenance, disposition and evaluation. Fisheries data and information represent decades of investment by MNRF, and if lost would be irreplaceable. Effective information management provides many benefits, including improved efficiency and productivity, better customer/client service, reduced costs, improved accountability and decision making, compliance with legal requirements, and minimized risk to information assets.

Information needed for legislation and policy development, or to guide management practices, must be timely, reliable, relevant and useful. Uncertainties and risks must be clearly stated. To achieve this, MNRF is actively striving to share scientific information and knowledge acquired from research and monitoring with decision makers, government agencies, stakeholders, and First Nations and Métis communities in a timely and accessible manner. Effective, plain language communication of scientific knowledge helps to promote understanding of complex ecological subjects and issues.

Many agencies, stakeholders, industry and First Nations and Métis communities and organizations have knowledge about aquatic ecosystems, and collect and store fisheries and aquatic data, so there is also a need to harmonize and share knowledge and information wherever appropriate. All must be afforded the opportunity to contribute this information, and be informed of how it will be used, protected, and considered.

Tactics under Objective 4.3 are intended to promote a coordinated and standardized approach to the collection, management and sharing of data, information and knowledge.

Tactics

a) Develop and implement an information management strategy to improve the management of fish and aquatic ecosystem information and to enable more efficient and effective coordination and exchange of data, information and knowledge amongst MNRF staff, other agencies, First Nations and Métis communities, stakeholders, industry and the general public.

b) Develop, maintain, share and improve where necessary database management systems for the effective entry, storage, analysis, retrieval, reporting and dissemination of fish and aquatic ecosystem data.

c) Continue to coordinate efforts to collect, store, and share fisheries and aquatic data and information, using common data standards, with other agencies, First Nations and Métis communities, stakeholders, industry and academia.

d) Develop, manage and maintain information in provincial aquatic/fisheries databases that are accessible to a broad audience.

e) Work collaboratively with First Nations and Métis communities to explore ways to appropriately consider and share ATK in fisheries policy development, management planning and decision making.

Brook Trout (*Salvelinus fontinalis*). R. MacGregor and N. Butala

MNRF

GOAL 5

GOAL 5:

INFORMED AND ENGAGED STAKEHOLDERS, PARTNERS, FIRST NATIONS AND MÉTIS COMMUNITIES AND GENERAL PUBLIC

As the lead fisheries management agency in Ontario, MNRF has responsibility for developing fisheries management plans at a number of spatial scales. Broad acceptance of a fisheries management plan can only be attained through meaningful, open and inclusive public involvement. A structured, adaptive fisheries planning and management framework helps to achieve this acceptance by incorporating the knowledge and perspectives of a broad range of fisheries stakeholders and other interested parties. Working together is therefore fundamental to the achievement of this Strategy's goals, especially Goals 1 and 2. A collaborative approach helps to share the work of protection, restoration and rehabilitation, and science, but also builds public interest, awareness, and a sense of responsibility in the care of local water bodies and fisheries. A strong education component promotes responsible fishing practices and local stewardship, while encouraging the involvement of a wide range of individuals, groups and communities in fisheries planning and management.

Goal 5 Objectives:

5.1 Manage fisheries using an inclusive and participatory approach.

5.2 Develop effective partnerships among government agencies, industry, academics, First Nations and Métis communities and stakeholders.

5.3 Encourage individuals, stakeholders and communities to act as effective stewards.

5.4 Increase public awareness and understanding.

MNRF promotes a participatory approach and consultative management, emphasizing partnerships and collaboration with all interested parties. Key partners include First Nations and Métis communities, municipal, provincial and federal agencies (especially DFO), Conservation Authorities, academia, and stakeholder groups representing the commercial, recreational and, bait fishing industries, the tourism industry, NGOs, conservation groups, cottage and lake associations, as well as many local fishing clubs. These groups provide important links to the province's hundreds of thousands of recreational anglers, commercial fishers and First Nations and Métis peoples, all of whom play active roles in the protection and conservation of fisheries, in habitat protection and rehabilitation, in the promotion of fishing, and in associated education and outreach. Recreational and commercial fishers also contribute financially to the protection of Ontario's fish resources through the purchase of licences, with funds from licence sales dedicated to the conservation of fish and wildlife resources.

Objectives under Goal 5 emphasize actions that employ a participatory approach for managing fisheries, encourage stewardship, develop effective partnerships, and inform and engage others.

Objective 5.1: Manage fisheries using an inclusive and participatory approach

Fisheries management decisions often have to balance ecological, social and economic objectives, and require more than just science information. MNRF's structured, adaptive approach to fisheries management and planning provides opportunities for stakeholders to provide input and influence fisheries management objective setting and decisions. This active involvement of resource users in the decision making process contributes valuable perspectives and knowledge to complement MNRF's understanding of fisheries resources, and helps to achieve broader public acceptance of management decisions (see text box, this page).

Tactics under Objective 5.1 focus on effective engagement of those with an interest in managing fish, fish communities, and supporting ecosystems to ensure active participation and use of the best available knowledge in decision making.

Tactics

a) Continue to establish and support fisheries management advisory groups at appropriate scales, and use well-defined structured processes to inform decision-making and resolve conflicts.

b) Continue to develop mechanisms and processes to:

- Include stakeholders, partners, First Nations and Métis communities, and the public in developing and supporting measurable fisheries management objectives and actions through fisheries management planning and decision making processes.
- Understand and incorporate the needs and perspectives of fisheries resource users in planning and management decisions.
- Increase First Nations and Métis community involvement in fisheries planning and management.

FISHERIES MANAGEMENT ZONE ADVISORY COUNCILS: A PARTICIPATORY APPROACH TO FISHERIES MANAGEMENT

With the creation of Fisheries Management Zones (FMZs) in 2008, MNRF made a commitment to increase the involvement of the public in recreational fisheries management decision making. FMZ Advisory Councils were established to meet that commitment.

Councils are involved throughout the fisheries management planning process from the development of fisheries objectives to the determination of appropriate management actions. At key stages in the planning process, broader public input is sought, which informs FMZ Advisory Council advice, and ultimately MNRF decision making. The end results are fisheries management plans and objectives that reflect a shared vision for our future fisheries and, having included meaningful input, garner support from the public.

Objective 5.2: Develop effective partnerships among government agencies, industry, academics, First Nations and Métis communities and stakeholders

MNRF has clear responsibilities related to some aspects of fisheries management but, as noted in Section 5, the ministry works in partnership with others to deliver its full mandate (see text box, page 52). Partnerships are especially important in protecting the aquatic ecosystems on which fish populations depend. These partnerships take a variety of forms, including informal, short-term cooperative arrangements, and more formal long-term collaborations. Partnerships with other agencies tend to be more formal, and centre on the delivery of one or more coordinated programs, aiming to achieve administrative efficiencies by avoiding overlap and duplication. This joint responsibility for fisheries resource stewardship carries with it the need to share and make accessible data, information, and research results, as discussed under Objective 4.3.

Tactics under Objective 5.2 focus on how MNRF will work cooperatively with its partners to achieve the goals set out in this *Strategy*.

Tactics

a) Through existing or new partnership arrangements:

- Encourage the consideration and inclusion of MNRF's fisheries objectives in the development and implementation of international, national, provincial and municipal government policies, programs and decisions that may affect fisheries.
- Consider fisheries management objectives developed through other planning initiatives, such as National and Provincial Parks and Protected Areas planning and watershed based fisheries management planning, in the development of Fisheries Management Zone and Provincially Significant Inland Fisheries plans.

b) Use existing, and explore new, forums and mechanisms to enhance collaborative partnerships that will:

- improve communication, coordination, and sharing of information.
- further define roles, responsibilities and processes that guide program delivery.
- build long standing relationships that encourage a more active role by First Nations and Métis communities in fisheries planning and management.
- promote the health and well-being benefits of fishing and eating fish.

c) Encourage industries that benefit from Ontario's natural resources to participate in the protection and restoration of fisheries, through sponsorships and/or partnerships.

W. Wegman

AGENCY PARTNERSHIPS IN FISHERIES MANAGEMENT

The Ministry of Natural Resources and Forestry has a number of well-established formal agency partnerships in the management of fisheries. Examples include:

- The Canadian Council of Fisheries and Aquaculture Ministers (CCFAM), whose members include federal, provincial, and territorial government agencies with responsibility for fisheries management.
- The Canada-Ontario Fisheries Advisory Board (CONFAB), a partnership between DFO and MNRF to implement the Canada Ontario Fisheries Agreement (COFA).
- The Great Lakes Fishery Commission (GLFC), a Canada-US body formed under the 1955 Convention on Great Lakes Fisheries. Its role is to conduct research and make recommendations on the management of Great Lakes fisheries.
- Municipalities are key partners in the management of Ontario's fisheries resources, especially the protection of fish habitat, by controlling land use through official plans and zoning by-laws.

Objective 5.3: Encourage individuals, stakeholders and communities to act as effective stewards

Stakeholders such as lake and cottage associations, the Ontario Federation of Anglers and Hunters, Trout Unlimited, local fishing clubs and individual anglers directly contribute resources and human capital to the successful management and conservation of fish resources. Resource users understand the importance of sustaining water quantity and quality, and protecting **riparian** and aquatic habitats, as requirements for supporting sustainable healthy fisheries. These groups and individuals are important stewards of aquatic resources. They offer resources and numerous volunteer hours to conserve and rehabilitate fish populations, support monitoring activities, advocate for the protection of fish habitat, and play a lead role in habitat rehabilitation projects, often aimed specifically at improving fishing.

Tactics under Objective 5.3 are intended to encourage continued stewardship of fisheries, fish communities and supporting ecosystems.

Tactics

a) Provide opportunities, advice and support to individuals, organizations, communities and industry to encourage participation in fisheries and aquatic ecosystem stewardship activities.

b) Explore opportunities and mechanisms for broad-scale stewardship activities that address landscape level challenges.

c) Work with others to recognize the contributions and achievements in the promotion, conservation and rehabilitation of fisheries, fish populations and supporting ecosystems in Ontario, for instance through angler and stewardship awards and other public recognition programs.

d) Work with municipalities, stakeholders and the local tourism sector to protect, restore and rehabilitate fisheries and their supporting ecosystems, including fish habitat.

FISH ON-LINE: AN INTERACTIVE TOOL FOR INCREASING ACCESS TO FISHERIES INFORMATION

In 2011, the Ministry of Natural Resources and Forestry (MNRF) launched Fish ON-Line, a tool with which the public can access fisheries-related information. Lake characteristics, fish species presence, stocking information and angling regulations are all readily available. Recently, accessibility was enhanced by making the application compatible with mobile devices. MNRF intends to develop the tool further as a way for the public to provide feedback to fisheries managers.

Objective 5.4: Increase public awareness and understanding

Protection and conservation efforts are embedded in a complex social, cultural, political and economic context, making public awareness and engagement key factors for success. Communication and education about fisheries, their benefits, and the stresses affecting them can have a strong impact on conservation success and sustainability. MNRF's staff are knowledgeable about fisheries resources and play a key role in achieving this objective by providing fisheries information and expertise to the public and stakeholders. These activities occur in many ways, including participation in public and stakeholder meetings, involvement in fishing events and tradeshows, and collaboration with other agencies and organizations such as Ontario Parks and the Ontario Federation of Anglers and Hunters in public education and outreach.

The Natural Heritage Information Centre is Ontario's conservation data hub, with information about a variety of conservation initiatives, including those related to species at risk. The Government of Ontario's Fishing website provides anglers with information about regulations and licensing, trip planning, best practices, and fish species. It also serves as a distribution hub where stakeholders and the public can access consultation materials and information about public engagement opportunities throughout the fisheries management planning process. The text box on this page describes Fish ON-Line, one of MNRF's main mechanisms for disseminating fisheries information.

Reporting to the public on the state of Ontario's natural resources is a priority. It helps to improve government transparency and accountability, and supports partnerships and community involvement in the management of Ontario's fish resources.

Tactics under Objective 5.4 are intended to increase public awareness and understanding of the benefits provided by healthy fisheries, fish communities and supporting ecosystems.

Tactics

a) Continue to share MNRF expertise with the public by

- providing opportunities for the public to engage with fisheries management staff at events such as tradeshows, stakeholder meetings and Ontario Parks Programs.
- developing and implementing community-based outreach and education programs, in partnership with others, to raise public interest and generate awareness about issues affecting fisheries resources and their management.

b) Develop and implement an overarching provincial fisheries communication strategy, including

- regular reporting to the public on the status and trends of Ontario's fisheries resources, and the progress made toward achieving fisheries management objectives.
- conveying information about MNRF's roles and responsibilities in managing fisheries resources.
- delivery of information on fishing regulations and best management practices using a streamlined and consistent approach.
- sharing of data and information online through open data and summarized information products.
- further development of online and social media tools to enhance communication frequency, engage new stakeholders, and respond to emerging communication trends.

STATE OF RESOURCE REPORTING (SORR)

State of Resource Reports share information with the public about the health of Ontario's fish, fisheries and supporting ecosystems, including the condition of the resource, the factors influencing the resource and current management actions. Analysis and interpretation of data from monitoring programs provides the foundation for SORR.

MNRF

8. Implementation

Ontario's Provincial Fish Strategy: Fish for the Future represents a major step forward in strategic planning for Ontario's aquatic ecosystems and fisheries. Embedded within the Strategy are several overarching themes that provide the framework for managing fish resources and are consistent with policy direction elsewhere in the Ontario government:

- First, MNRF is moving toward managing at broader scales and over longer time periods. This means a shift in fisheries management thinking from the level of a single site or species to consideration of broader ecosystem structures and processes.
- Second, the complexity of fisheries management demands use of a risk-informed approach to establish priorities for protection and management of fisheries and their supporting ecosystems. This is consistent with practice elsewhere in the Ontario government.
- Third, the dynamic nature of ecological systems and the uncertainty inherent in major drivers such as population growth, development, and climate change make it important to manage adaptively. Adaptive management means periodic review and revision of management actions and information gaps as the knowledge base evolves.

Several other core themes are critical for achievement of the *Strategy*'s Goals and Objectives, and echo direction from MNRF's Strategic Direction document, *Our Sustainable Future* (OSF).

- A **robust science knowledge base** is an essential foundation for wise resource management decisions, identifying emerging threats, and effectively informing the development of strong public policy (Goal 3 in OSF).
- While MNRF has lead responsibility for the protection and management of Ontario's fisheries resources, successful implementation of this Strategy will require **effective partnerships and community involvement** (Goal 5 in OSF). Special emphasis is placed on strengthening collaboration and relationships with First Nations and Métis communities, and with major stakeholder groups and partner agencies.
- MNRF's passionate and engaged workforce is its greatest asset. **Continuous learning, ongoing staff training and effective internal communication** (Goal 6 in OSF) contribute to organizational excellence and optimal use of staff resources.

Top photo: Northern Pike (*Esox lucius*). M. Garvin

The goals, objectives and tactics laid out in this *Strategy* provide direction to MNRF for its own work, but will also help the ministry support and guide the work of others involved in the conservation and management of Ontario's fisheries resources. While MNRF will lead the implementation of *Ontario's Provincial Fish Strategy*, achievement of its Goals and Objectives will require the effective engagement and commitment of all partners and a wide variety of stakeholders. This document does not offer detailed guidance on implementation, but provides the basis for developing implementation plans that will identify specific actions. This will require ongoing analysis and discussion related to the identification of key priorities and requirements. Provincial implementation priorities will be identified first, and then used to guide fisheries action plans at regional or other scales.

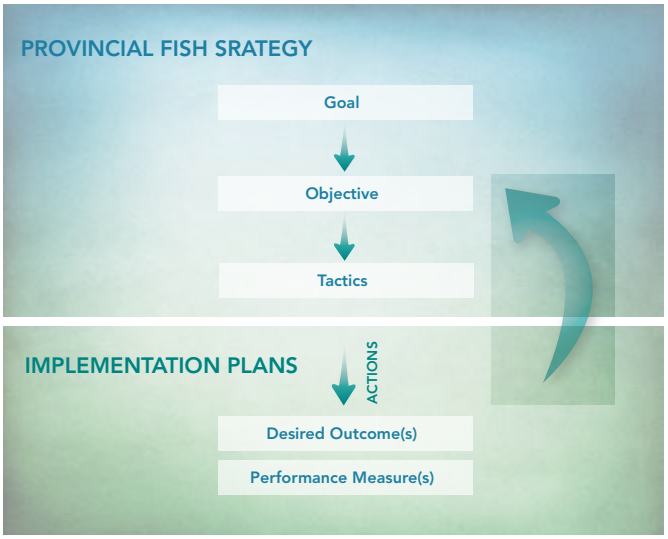


Figure 5. MNRF will use performance measures (indicators) to monitor and evaluate progress toward Goals and Objectives. Measured data will be compared against benchmarks of sustainability, to support the periodic review and revision of management objectives and strategies.

SETTING FISHERIES MANAGEMENT ZONE (FMZ) OBJECTIVES CONSISTENT WITH PROVINCIAL GOALS AND OBJECTIVES: AN EXAMPLE

MNRF has developed indicators of abundance for Lake Trout (and other common fish species) based on results from the Broad-scale Monitoring (BsM) Program on inland lakes. These indicators can be tracked over time to measure progress towards meeting FMZ goals and objectives, and combined across zones to determine if provincial goals are achieved. Where possible, FMZ objectives should be SMART: **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**ime-sensitive.

Goal 1 of this Strategy is "Healthy ecosystems that support self-sustaining native fish communities." Objective 1.3 is to "Restore, recover or rehabilitate degraded fish populations and their supporting ecosystems, including fish habitat," and Tactic a) under that objective is to "Develop and implement rehabilitation or restoration plans for degraded native fish populations and fish habitats"

Goal 2 of this Strategy is "Sustainable fisheries that provide benefits for Ontarians." Objective 2.1 is to "Harvest fish within safe biological limits", and tactic a) under that objective is to "Develop and implement fisheries management plans with measurable objectives for Fisheries Management Zones."

Examples of measurable FMZ objectives that address both of these goals are:

- Increase the number of self-sustaining Lake Trout populations in the FMZ, by 20 lakes in 20 years.
- Increase the percentage of self-sustaining Lake Trout lakes that are above abundance benchmarks in the FMZ, from 32% to 50% within 20 years.
- Increase the proportion of mature (older than 10 yrs) females in Lake Trout populations in a majority of lakes in the FMZ, from 19% to 25% in 20 years.

MEASURING PROGRESS

An important part of implementation is the identification of specific desired outcomes and associated performance measures (indicators) that can be used to measure progress toward Goals and Objectives (see Figure 5). Performance measures must be specific and feasible; most are quantitative.

A variety of approaches will be used to define science-based performance measures. In many cases it will be necessary for MNRF to collaborate with partner agencies, major stakeholders, and the broader scientific community to arrive at measurable targets and workable performance measures. Performance measures will need to be reviewed periodically, as part of adaptive management, to determine if they continue to be meaningful or require adjustment. The text box on this page provides an example of how performance measures can be used to track progress toward Fisheries Management Zone objectives.

REALIZING THE VISION

Ontario's Provincial Fish Strategy: Fish for the Future builds upon four decades of strategic planning for Ontario's fisheries and MNRF's vision of:

> *Healthy ecosystems supporting native self-sustaining fish communities, and fisheries that provide long-term ecological, social, economic, cultural and health benefits for the people of Ontario.*

The ministry's vision is aimed at improving the conservation and management of fisheries resources, and promoting, facilitating, and encouraging fishing as an activity to achieve benefits that can be sustained over the long term.

The ministry's vision can be summarized in two broad outcomes:

1. Biodiversity conservation, where:

- aquatic ecosystems and habitats are healthy;
- common fish species remain common;
- fewer aquatic alien species are introduced and the spread of invasive species is slowed; and
- the status of fish species at risk is improved.

2. Sustainable fisheries, where:

- abundance of fish populations is greater than that expected at Maximum Sustainable Yield;
- fishing mortality is lower than natural mortality;
- benefits derived from the fisheries resource increase;
- more people are fishing; and
- more people are involved in the management of Ontario's fisheries.

These outcomes cannot be achieved without a strong integrated foundation of policy and legislation, effective partnerships with other agencies, First Nations and Métis communities and key stakeholder groups, and informed and engaged members of the public. Specific efforts will therefore be made during the implementation of this *Strategy* to strengthen existing collaborative and cooperative arrangements, and continue to build effective long lasting partnerships.

I. Rayner

M. Garvin

NEXT STEPS

Ontario's Provincial Fish Strategy provides guidance for fisheries policy development and review, management planning and activities, and identification of enforcement and science priorities. The first step in developing an implementation plan for this *Strategy* is to undertake a gap analysis, to determine which tactics and actions are already in place, and which require modification, enhancement or development. Engagement and consultation with other agencies, First Nations and Métis communities and key stakeholder groups will help set priorities for implementation, and clarify how the tactics and actions in this *Strategy* can be implemented at provincial, Fisheries Management Zone or local scales.

Consistent with an adaptive management approach, this *Strategy* will be reviewed periodically. As part of that process, objectives, recommended tactics, and performance measures may be refined and re-prioritized, and further tactics may be identified. In addition, information gaps and science priorities will be reviewed and used to inform the next management cycle. Progress toward achievement of the goals, objectives and outcomes of the *Strategy* will be measured regularly and reported on through provincial State of Resource Reporting.

Everyone has a role to play in managing Ontario's fisheries resources. The complexity of Ontario's fisheries, fish communities, and the aquatic ecosystems that support them demands a collaborative approach grounded in sound science. *Ontario's Provincial Fish Strategy: Fish for the Future* signals a new approach to managing Ontario's fisheries resources, one that is focussed, ecosystem-based, collaborative and adaptive. It is intended to lay the foundation for a dynamic process, guide the work of MNRF staff, partner agencies, First Nations and Métis communities and key stakeholders as they strive to achieve strategic goals for Ontario's fisheries resources.

I. Rayner

9. Appendix 1: Glossary

Aboriginal Peoples: Use of the term Aboriginal in this *Strategy* is intended to be consistent with the definition provided in the *Constitution Act, 1982.* "Aboriginal peoples of Canada" includes the Indian, Inuit and Métis peoples of Canada.

Aboriginal Traditional Knowledge (ATK): Aboriginal Traditional Knowledge, the traditional knowledge held by First Nations and Métis peoples.

Adaptive Management: A systematic approach to improving management and accommodating change by learning from the outcome of management interventions.

Alien Species: Species of plants, animals, and micro-organisms introduced by human action outside their natural past or present distribution.

Allocation: Assignment of aquatic resources for fish production and other water uses. This includes providing for sufficient numbers of fish to escape harvest in order to perpetuate the fishery as well as assigning a portion of the annual allowable yield to a group or individual.

Aquaculture: The breeding or husbandry of fish.

Bait Fisheries: The commercial harvest of baitfish and leeches for sale as bait in recreational fisheries.

Benchmark(s): A reference value used to assess progress towards achieving fisheries management targets/objectives.

Biodiversity: The natural variety and variability among all living organisms from all sources, including among other things, terrestrial, marine and other aquatic ecosystems, the ecological complexes in which they naturally occur, and the ways in which they interact with the physical environment. Biodiversity includes the diversity of genes, populations and species, and communities and ecosystems.

Bycatch: The capture of any fish, bird, mammal, reptile, amphibian, or any species at risk of any type in commercial fishing gear which cannot be legally harvested.

Climate Change: Any change in climate over time due to natural variability or as a result of human activity.

Climate Change Adaptation: The ability to respond and adjust to actual or potential impacts of changing climate conditions to moderate harm or take advantage of any positive opportunities such changes may afford.

Collaboration: Involves partners working together to reach an identified and shared goal. Collaboration exists where (1) partners share mutual interests, goals and objectives, (2) partners each invest knowledge, skills, and resources to achieve jointly identified outcomes, and (3) success and achieving planned results brings benefits to each party. Collaboration does not imply legislative authority, jurisdiction, or devolution of responsibility.

Conservation: The management of the human use of natural resources so they may yield the greatest sustainable benefit to current generations, while maintaining the potential to meet the needs of future generations. Thus, conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment.

Commercial Fisheries: The capture or attempt to capture any species of fish from natural environments using various commercial capture gear (including but not limited to gill nets, pound or trap nets, seines, trawls, set lines or hoop nets) with the primary intent of selling the catch for human consumption.

Control: To limit or curb. In the context of invasive species management, control means keeping population sizes of invasive species at an acceptably low level.

Cumulative Effects: see Cumulative Impacts.

Cumulative Impact(s): An impact on the environment that results from repeated actions of the same type in the same area over time, or from the synergistic interaction of different stressors to cause an impact that is greater than that of any single stressor taken alone. Cumulative impact assessment should include evaluation of past, present, and reasonably foreseeable future actions.

Ecosystem(s): A dynamic complex of plant, animal and micro-organism communities and their physical environment functioning as an ecological unit.

Ecosystem-based Approach: An adaptive process that aims to understand the interrelationship between social, economic and natural environments while recognizing the balance between human needs and managing for ecosystem integrity. The application of an ecosystem approach requires the consideration of cumulative effects on the affected environment.

Ecosystem Diversity: The variety of ecosystems present across a landscape, including habitats, plant and animal communities and associated ecological processes.

Ecosystem Health: The ability of an ecosystem, through its structure and functions, to sustain biological diversity, biotic integrity and biological processes over time.

Ecosystem Resilience: The capacity of an ecosystem to adapt to changes and disturbances and still retain its basic functions and structures.

Extirpated: Locally extinct. An extirpated Ontario species lives somewhere in the world, and at one time lived in the wild in Ontario, but no longer lives in the wild in Ontario.

Fish(es): Includes parts of fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals (as defined in the *Fisheries Act*).

Fish Community Objectives: In the context of Great Lakes fisheries management, they provide a common framework for agencies to develop and implement complementary fishery management programs.

Fish Habitat: Spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes (as defined in the *Fisheries Act*).

Fish Stock(s): A group or aggregation of members of a species, sufficiently different from other groups of the same species (e.g., in behaviour, range, time and place of breeding, etc.), that it requires its own separate management scheme.

F_{ext}: Fishing mortality rate that results in extinction of a stock.

F_{msy}: Fishing mortality rate at the point of Maximum Sustainable Yield (MSY).

Fishery/Fisheries: A term that is usually used to describe the human use of fish, and includes catching, preparing and selling fish.

Fisheries Management Zone (FMZ): The province's 20 FMZs are the primary units for planning, management and monitoring most fisheries in Ontario, and were determined using a combination of ecological factors and angler use patterns.

Fisheries Resource(s): Ontario's fisheries resources include fish species, fish communities, commercial, recreational and Aboriginal fisheries, and the aquatic ecosystems that support them. In the interests of brevity, this *Strategy* refers to "Ontario's fisheries resources" to reflect this broader meaning.

Fishing Mortality (F): The mortality rate of a fish stock resulting from fisheries exploitation.

Genetic Diversity: The variety of genetic information contained within individuals of a particular species. It improves a species' ability to cope with environmental stresses such as climate change.

Great Lakes Basin: The five Laurentian Great Lakes (Ontario, Erie, Michigan, Huron and Superior) and the St. Lawrence River, as well as the surrounding lands, rivers and streams that flow into and connect them.

Habitat Protection: The prescribing of guidelines and conditions, and enforcement of laws, for the purpose of preventing the harmful alteration, destruction or disruption of fish habitat.

Habitat Restoration: The treatment or clean-up of altered, disrupted or degraded fish habitat for the purpose of increasing its capability to sustain a productive fisheries resource.

Hatchery-dependent: Fisheries that depend on the stocking of hatchery-raised fish to supplement the supply of naturally reproducing fish or to create new fisheries where natural reproduction is not possible.

Hazard(s): A condition that has the potential to cause harm and/or loss of property. A hazard may be natural (a flood or forest fire), technological (a widespread power failure) or human-caused (an abandoned mine).

Indicator(s): Variables that are measured to track progress toward fisheries objectives, for example the measured natural mortality rate of a fish population.

Introduced: A species relocated to an area where it does not occur naturally. Introduction can be deliberate or accidental, and can include exotic species, naturalized species, and native species that are stocked or otherwise transported into new waters.

Introduction: Entry of an organism to a geographic region, brought about by human action, resulting in the establishment of a population.

Invasive Species: Alien species whose introduction or spread threatens the environment, the economy, and/or society including human health.

Issue(s): A concern that impedes achievement of a goal.

Keystone Ecosystem(s): An ecosystem that plays a special or unique role in the landscape.

Keystone Process(es): An ecological process that is especially important in the structure or function of a particular ecosystem. If a keystone process is disrupted, the overall function of the ecosystem is significantly impaired and its resilience reduced.

Keystone Species: A species that plays a disproportionately important role in the structure or function of an ecosystem. If the species were to be removed, the ecosystem would experience dramatic change, or might cease to exist altogether. Keystone species are often, but not always, predators.

Knowledge: For the purposes of this document, knowledge is defined as tangible information, including data, that is the result of research, analysis, experience and relationships and that when placed in context, generates understanding.

Lake(s): A standing body of water; including a pond.

Landscape Management: A management approach that considers complexes of ecosystems, often over broad spatial scales and long time periods. The appropriate landscape management scale depends on ecological factors such as climate, the resources of interest and the stresses that affect them, and social and economic factors such as human population density, demand for fishing, jurisdictional boundaries, and road access.

Landscapes: Complexes of ecosystems in geographically defined areas.

Maximum Sustainable Yield (MSY): The maximum harvest that can be sustained over the long term, without detrimental effects on the population.

Mitigation: Actions taken during the planning, design, construction and operation of works and undertakings to alleviate potential adverse effects on the productive capacity of fish habitats.

Native Species: Species that occur naturally in a region, or which have migrated into the region and become established through natural mechanisms. Native species do not include species that have been transported by humans or have been able to establish themselves because of human alterations of the region's environment.

Natural Capacity: The natural limit of aquatic ecosystems to produce fish. There is a limit to the natural capacity of aquatic ecosystems and hence the benefits that can be derived from them now and into the future.

Natural Heritage: Geological features and landforms; associated terrestrial and aquatic ecosystems; their plant species, populations and communities; and all native species, their habitats and their sustaining environment.

Natural Mortality (M): Mortality from natural causes.

Naturalized Species: Alien species (species introduced outside their natural past or present distribution) that have established stable self-sustaining populations.

Offsetting Measures: Measures that are undertaken to counterbalance unavoidable serious harm to fish resulting from a project, with the goal of maintaining or improving the productivity of the commercial, recreational or Aboriginal fishery.

Processes (ecosystem): The interactions and connections between living and non-living systems, including the movement of energy, nutrients and species.

Protected Area(s): Clearly defined geographic space(s), recognized, dedicated and managed through legal or effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Protection: Commitment to protect individual organisms, a population or subpopulation of organisms, or an ecosystem (or portions of one) from adverse impacts.

Quota(s): A mechanism used to regulate commercial fishing that defines the number or weight of fish of a particular species, which an individual fisher under licence is allowed to harvest.

Recovery: An action that is taken to reduce or eliminate a condition or circumstance that causes a species to be listed as threatened, endangered or extirpated.

Recreational Fisheries: Fish caught under the authority of a license for personal benefit (e.g. food, sport).

Rehabilitation: The return of a species, a population or an ecosystem to a healthy, functioning state.

Resilience: see Ecosystem Resilience

Restoration: The return of a species, a population or an ecosystem to the state in which it existed prior to a disturbance.

Riparian (areas): The banks or sides of streams, rivers and other bodies of water, including vegetative cover. Riparian areas help to remove sediments from water, reduce erosion and flooding and support wildlife populations, including providing fish habitat.

Risk Assessment: The process of characterizing the likelihood of an unacceptable outcome and the magnitude of the consequences of that outcome. Likelihood may be determined qualitatively or quantitatively based on the type and amount of information available. The magnitude of the consequences can be measured in biological and socio-economic terms.

River(s): A flowing body of water; including creeks, streams, or brooks.

Science: Refers to research (i.e., the development and synthesis of fact-based knowledge derived through rigorous scientific methods) as well as related activities such as monitoring and assessing resources, transferring science knowledge, and providing scientific advice. Both natural and social science are included in this definition.

Socio-economic Factors: The social and economic aspects of fisheries resources use and management, including considerations such as demographic patterns and trends, economic activity (spending), and cultural norms and preferences.

Species: A group of genetically similar individuals that actually or potentially interbreed.

Species Diversity: The variety of species found in a given region or habitat.

Species at Risk: Any wild plant or animal threatened by or vulnerable to extirpation or extinction. Under Ontario legislation, species at risk are assigned a designation to represent the degree of imperilment (Special Concern, Threatened, Endangered or Extirpated).

Spread: The expansion of the geographical distribution of an organism within a geographical region.

Stakeholder(s): A person or organization (for example, an NGO) with an interest or stake in fisheries and the aquatic ecosystems that support them.

Stewardship: An ethic that embodies cooperative planning and management of environmental resources in which individuals, organizations, communities and other groups actively engage in the prevention of habitat loss, as well as the facilitation of resources recovery and/or rehabilitiation, usually with a focus on long-term sustainability.

Stress(es): A stimulus or succession of stimuli which, if of sufficient magnitude, will tend to disrupt the stability of a system.

Structured Decision Making: A strategic process that promotes transparency, collaboration, and an integrated systems approach for supporting more informed, defensible and long-lasting decisions.

Sustainable: The potential for long-term maintenance of well-being, which has environmental, economic and social dimensions.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable Use: the use of natural resources in a way and at a rate that conserves an ecological balance without depleting or permanently damaging them, thereby maintaining the potential for future generations to meet their needs and aspirations. **Target(s):** A future desired value of an indicator.

Thermal Regime(s): Thermal regime describes the typical summer water temperature of a water body. Water bodies may be classified as cold, cool or warm. Thermal regime is determined using measures of water temperature or is inferred from knowledge of the existing fish or invertebrate community.

The thermal regime of lakes, reservoirs, and ponds can be classified based on fish community:

> **Coldwater Lakes:** an assemblage of fishes in north-temperate oligotrophic lakes, dominated by salmonines and coregonines. Lake Trout, Brook Trout and Lake Whitefish are species typically found in coldwater lakes.
>
> **Coolwater Lakes:** an assemblage of fishes in north-temperate mesotrophic lakes dominated by percids and esocids. Walleye and Northern Pike are species typically found in cool water communities.
>
> **Warmwater Lakes:** an assemblage of fishes in north-temperate eutrophic lakes dominated by centrarchids (e.g., Largemouth Bass), cyprinids (Carp) and ictalurids (Bullheads).

The thermal regime of rivers, streams, and creeks can be classified based on mean summer water temperature, fish community or invertebrate community:

> **Coldwater Rivers/Streams:** (<19 °C) an assemblage of fishes characterized by the presence of salmon, trout and sculpin species. Slimy Sculpin, Brook Trout and American Brook Lamprey are the best indicator species of a coldwater environment.
>
> **Coolwater Rivers/Streams:** (19 °C -25 °C) an assemblage of fishes often characterized by percids (e.g., Walleye, Iowa Darter), esocids (e.g., Northern Pike).
>
> **Warmwater Rivers/Streams:** (> 25 °C) an assemblage of fishes often characterized by Largemouth Bass, Bluegill, Carp, Bullheads, or Bowfin.

Traditional Knowledge: Knowledge gained from generations of living and working within a family, community or culture.

Vulnerability Assessment: The analysis of the expected impacts, risks and the adaptive capacity of a species or habitat to the effects of climate change or other broad-scale stresses.

Watershed(s): The area of land that drains into a river, lake or other water body.

10. Appendix 2: List of Acronyms

AIS: Aquatic Invasive Species

ATK: Aboriginal Traditional Knowledge

BHA: Bait Harvest Area

BsM: Broad-scale Monitoring

CCFAM: Canadian Council of Fisheries and Aquaculture Ministers

COFA: Canada-Ontario Fisheries Agreement

CONFAB: Canada Ontario Fisheries Advisory Board

DFO: Department of Fisheries and Oceans

EFFM: Ecological Framework for Recreational Fisheries Management

F: Fishing Mortality

FMOs: Fisheries Management Objectives

FMZ: Fisheries Management Zone

GLFC: Great Lakes Fishery Commission

M: Natural Mortality

MMAH: Ministry of Municipal Affairs and Housing

MNR: Ministry of Natural Resources

MNRF: Ministry of Natural Resources and Forestry

MOECC: Ministry of Environment and Climate Change

MSY: Maximum Sustainable Yield

NGOs: Non-Governmental Organizations

OFAH: Ontario Federation of Anglers and Hunters

OSF: Our Sustainable Future: A Renewed Call to Action

PGT: Put-Grow-Take

PPS: Provincial Policy Statement

PSIFs: Provincially Significant Inland Fisheries

SEV: Statement of Environmental Values

SPA: Special Purpose Account

SPOF: Strategic Plan for Ontario Fisheries

SPOFII: Strategic Plan for Ontario Fisheries II

WBFiMPs: Watershed-Based Fisheries Management Plans

MNRF – COA

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